

Total No. of Printed Pages: 02

SUBJECT CODE NO:- H-631
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Metrology & Quality Control
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Attempt any three questions from each section.
2. Assume suitable data if necessary.
3. Figures to the right indicate full marks.

Section A

- | | | |
|-----|--|----|
| Q.1 | a) What are the different sources of error? | 07 |
| | b) Explain the working of sine bar with a neat sketch. | 06 |
| Q.2 | a) Explain Reed type mechanical comparator. | 07 |
| | b) Explain the phenomenon of light wave interference. | 06 |
| Q.3 | a) Explain the construction and working of Taylor Hobson Taly surf. | 07 |
| | b) What are the different types of fits? Give an example of each. | 06 |
| Q.4 | a) Explain construction and working of profile projector. | 07 |
| | b) Explain construction and working of co. ordinate measuring machine (CMM). | 06 |
| Q.5 | Write short notes on (any two) | 14 |
| | a) NPL Interferometer | |
| | b) Angle Dekkor | |
| | c) LASER in Metrology | |

Section B

- | | | |
|-----|--|----|
| Q.6 | a) Explain the concept of quality circle. | 07 |
| | b) What is cause & effect Diagram? Explain with an example. | 06 |
| Q.7 | a) What is scatter diagram? Explain its three types. | 07 |
| | b) What is fault Tree analysis (FTA)? Explain with an example. | 06 |
| Q.8 | a) What is "Kaizen"? Explain with an example. | 07 |
| | b) What is "Kanban"? Explain with an example. | 06 |
| Q.9 | a) What is process capability? Explain with an example. | 07 |
| | b) What is Acceptance sampling? State its advantage and disadvantages. | 06 |

Q.10 Write short notes on (any two)

- a) OC Curve
- b) JIT
- c) FMECA

Total No. of Printed Pages: 02

SUBJECT CODE NO:- H-638
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Energy Conservation and Management
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
1. Question no 1 & 6 are compulsory.
 2. From remaining questions solve any two from each section.
 3. Figures to right indicates marks.
 4. Draw a neat sketch wherever required.
 5. Assume suitable data wherever required.

Section A

- | | | |
|-----|---|---------------------|
| Q.1 | Solve the following | 10 |
| | <ol style="list-style-type: none"> a) What is primary and secondary energy source? b) What are different applications of compressed air system? c) State the significance of co-generation d) What is Kyoto protocol about? e) What are different types of biofuels? | |
| Q.2 | <ol style="list-style-type: none"> a) What is energy conservations act? Explain b) What is the concept of clean development mechanism (CDM)? Explain? | <p>08</p> <p>07</p> |
| Q.3 | <ol style="list-style-type: none"> a) To make boiler work energy efficient, how energy conservation in boiler is considered? b) What is biofuels? What are recent international advance in biodiesel? Explain. | <p>08</p> <p>07</p> |
| Q.4 | <ol style="list-style-type: none"> a) With practical example explain the cogeneration in sugar industry. b) What energy pricing is? Explain | <p>10</p> <p>05</p> |
| Q.5 | Write short note any two:-
<ol style="list-style-type: none"> a) Road map of JNNSM b) Energy conservation in pumps and fans c) Photovoltaic system. | 15 |

Section B

- | | | |
|-----|---|---------------------|
| Q.6 | Solve the following | 10 |
| | <ol style="list-style-type: none"> a) What is the strategy for daylight control? b) What are merits of E-vehicles? c) What are different types of energy audits? d) How biomass is of used with reject to energy? e) With example list different renewable and non-renewable energy sources. | |
| Q.7 | <ol style="list-style-type: none"> a) What are different E-vertical power storage options? Explain. b) What is the present status in the development of E-verticals? | <p>08</p> <p>07</p> |

- Q.8 a) With a case study of sugars industry explain how energy audit is done? 08
b) For economical functioning of any system it is essential to have energy audit justify the statement. 07
- Q.9 a) In what way there can be investment on energy efficient appliances? Explain? 08
b) What is energy flow sankey diagrams explain? 07
- Q.10 Write short note on any two:- 15
 - a) Charging station for E-vehicle
 - b) Energy efficient illumination
 - c) Energy scenario.

Total No. of Printed Pages: 1

SUBJECT CODE NO:- H-648
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I Power Plant Engineering
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q. No.5 and 10 are compulsory.
 - ii) Solve any two questions from Section-A (Q. 1, 2, 3, 4) and Section B (Q. 6, 7, 8, 9)

Section A

- Q.1
- a) Explain the effect of variable load on power plant? 07
 - b) Explain the load duration curve with example? 07
- Q.2
- a) What are the site selection criteria's for thermal power plant? 07
 - b) Explain in detail working of thermal power plant? 07
- Q.3
- a) Explain the ash handling and dust collection units of coal thermal power plant? 07
 - b) Explain types of boiler draught system? 07
- Q.4
- a) Enlist merits and de-merits of Diesel power plant over thermal power plant? 07
 - b) Explain present trends in diesel research? 07
- Q.5
- Write short notes on any three 12
- 1) Cooling tower
 - 2) Supercharging of diesel engine
 - 3) Capacity and diversity factors
 - 4) Layout of thermal power plant

Section B

- Q.6
- a) What are environmental aspects of power generation? 07
 - b) Explain cost of energy production? 07
- Q.7
- a) What are site selection criteria's for hydroelectric power plant? 07
 - b) Explain different types of dam? 07
- Q.8
- a) Explain different components of hydro station reservoirs? 07
 - b) Explain surge tank and water hammering effects? 07
- Q.9
- a) Explain with neat sketch pressurized water reactor (PWR)? 07
 - b) Explain function of control rods, moderators and fuel rods in the nuclear power plant? 07
- Q.10
- Write short notes on any three. 12
- 1) CANDU reactor
 - 2) Hydrographs
 - 3) Tariffs for electrical energy
 - 4) Safety rules in nuclear power plant.

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-649
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Elective-I Production Planning and Control
[CGPA]

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Solve any three questions from each Section.
 - 2) Figures to the right indicate full marks.
 - 3) Assume suitable data if required & state it clearly.

Section A

- Q.1 a) Describe production procedure or production cycle. 08
 b) Explain centralized and decentralized PPC. 05
- Q.2 a) Define continuous production system. Differentiate between mass production & flow production. 05
 b) What are different methods of forecasting? Discuss merits & demerits of various methods. 08
- Q.3 a) Following data refers to past sales of one product: 10

Year:	1982	1983	1984	1985	1986	1987	1988	1989	1990
Sales in Rs. (crore):	39	54	62	73	85	100	95	105	120

Use least square method & estimate sales forecasting of year 1992.

- b) Explain the need for forecasting. 03
- Q.4 a) What are seasonal variations? Why they are important in forecasting? 04
 b) Explain Q system (fixed order quantity) and P system (Periodic review system). 09
- Q.5 a) Describe the procedure for ABC analysis. Bring out the merits & demerits of ABC analysis. 07
 b) Derive an equation for EOQ with instantaneous stock replenishment. (Basic inventory model). 07

Section B

- Q.6 a) Define routing. Explain routing procedure in brief. 06
 b) Describe 'Route sheet' with suitable example. 07
- Q.7 a) Define the concept and strategies for aggregate planning. 06
 b) What is dispatching? State the various activities of dispatching in brief. 07
- Q.8 a) Describe the follow up or control phase of PPC. 07
 b) Discuss the concept of computer in production planning and control. 06

- Q.9 a) State and describe the steps involved in recruitment and selection of employees. 07
- b) Define recruitment. Describe the various sources of recruitment in brief. 06

- Q.10 a) Discuss the factors and restrictions to be considered while selecting materials. 07
- b) What are the factors to be considered while selecting a material? Explain. 07

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-650
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I Advanced Materials and Manufacturing
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Q.No.1 and 6 are compulsory.
- 2) Attempt any two questions from remaining four questions.
- 3) Figures to the right indicate full marks.

Section A

- | | | |
|-----|--|----------|
| Q.1 | Attempt following questions | 10 |
| | <ol style="list-style-type: none"> a) State application of Composite b) Enlist various types of polymers c) State the properties of smart materials d) Give classification of ceramics e) Give application of plastics and Elastomers | |
| Q.2 | <ol style="list-style-type: none"> a) With neat sketch explain particulates reinforced composite. b) Explain thermoplastics in detail. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a) Explain in detail significance and application of semi conductivity materials. b) Explain magneto materials with application. | 07
08 |
| Q.4 | <ol style="list-style-type: none"> a) Explain critical volume fraction in composites. b) Give the mechanical characteristics of elastomers in detail. | 07
08 |
| Q.5 | Write short notes on | 15 |
| | <ol style="list-style-type: none"> a) Ceramic matrix materials and application b) Thermoplastics c) Shape memory alloys | |

Section B

- | | | |
|-----|---|----------|
| Q.6 | Attempt following questions | 10 |
| | <ol style="list-style-type: none"> a) State application of flask less molding b) State principle of thermal spray coating c) State limitation of electro chemical machining d) Suggest a suitable method for making rail rools e) State specific application of Abrasive flow machining. | |
| Q.7 | <ol style="list-style-type: none"> a) With neat sketch explain evaporative casting. b) Compare between chemical vapor deposition and physical vapor deposition. | 07
08 |

- Q.8 a) Suggest a suitable method for Micro drilling and explain in detail. 07
b) Explain in detail electro less coating. 08
- Q.9 a) Explain Non-traditional Deburring process with specific example. 07
b) Discuss in detail advantages and application of electro stream drilling. 08
- Q.10 Write short notes on 15
 - a) Sheet molding casting v-process
 - b) Electroplating
 - c) Water jet machining

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-651
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Elective-I Advanced CAD/CAM
[CGPA]

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Solve any three questions from each section.
 - 2) Draw sketches to support your answers
 - 3) Abbreviations carry their usual meanings related to CAD/CAM.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Attempt any five of the following | 10 |
| | <ol style="list-style-type: none"> a) Define CAD b) Enlist common techniques of geometric modeling c) Define synthetic curve d) Draw surface of revolution e) What is NURBS f) Define surface g) What is Hermite cubic curve | |
| Q.2 | <ol style="list-style-type: none"> a) Discuss the functional areas of CAD. b) Illustrate the requirements of graphics software. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a) Explain curve manipulation in detail for Bezier curves. b) Present parametric representation of any two analytical curves | 07
08 |
| Q.4 | <ol style="list-style-type: none"> a) Illustrate blending of surfaces. b) Explain Hermite cubic surfaces | 07
08 |
| Q.5 | <ol style="list-style-type: none"> a) Present parametric representation of surfaces of revolution b) Classify wireframe entities in detail and draw the sketches | 07
08 |

Section B

- | | | |
|-----|---|----|
| Q.6 | Attempt any five of the following | 10 |
| | <ol style="list-style-type: none"> a) Define CAPP b) What are features of GKS c) Define Artificial Intelligence d) What is principle of CMM e) Define Tolerance f) List advantages of DNC | |

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-1151
FACULTY OF SCIENCE AND TECHNOLOGY
T.Y. B.Tech.(Mech/Prod) (Sem-VI)
Computational Techniques
[Old]

[Time: Two Hours]

[Max.Marks:40]

- N.B Please check whether you have got the right question paper.
- i) Use of non-programmable calculator is allowed.
 - ii) Q.No.1 and Q.No.5 are compulsory.
 - iii) Figures to the right indicate full marks.
 - iv) Attempt any two questions from the remaining questions from each section.

Section A

- Q.1 Answer the following multiple choice questions: 06
- a) While using False-Position Method, which of the following is second iteration for fourth root of 32?
 - i. 2.2462
 - ii. 2.335
 - iii. 2.3645
 - iv. 2.3770
 - b) ----- lies in the category of iterative method:
 - i. Bisection method
 - ii. Regula Falsi Method
 - iii. Sacent Method
 - iv. All of above
 - c) Back substitution procedure is used in:
 - i. Gaussian Elimination method
 - ii. Jacobi's method
 - iii. Gauss-Seidal method
 - iv. None of above
- Q.2 Enlist and explain types of errors. 07
- Q.3 Find a real root of the equation $F(X) = X^3 - X - 1 = 0$. use False Position Method. 07
- Q.4 Use Bisection method to determine the drag coefficient c needed for a parachutist of mass $m=68.1$ kg to have velocity of 40m/s after free falling for time 10s. Consider acceleration due to gravity is 9.81m/s^2 . Also consider: 07

$$v = \frac{gm}{c} [1 - e^{-(c/m)t}]$$

Section B

Q.5 Answer the following multiple choice questions: 06

- a) To apply Simpson's 1/3 rule, the number of intervals in the following must be:
 - i. 10
 - ii. 11
 - iii. 12
 - iv. 13
- b) Process of estimating the value of dependent variable at an intermediate value is called:
 - i. Interpolation
 - ii. Extrapolation
 - iii. Estimation
 - iv. Intrapolation
- c) Differences methods find the ----- solution of the system.
 - i. Numerical
 - ii. Analytical
 - iii. Particle
 - iv. Exact

Q.6 Find $F(33)$ from the Gauss forward formula: 07

X:	20	25	30	35	40	45
F(X):	354	332	291	260	231	204

Q.7 Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 1/8th rule. 07

Q.8 Find the least squares fit of the form $y = a_0 + a_1x^2$ to the following data: 07

X:	-1	0	1	2
Y:	2	5	3	0

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-1186
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech.(Mech) (Sem-VII)
Refrigeration & Air Conditioning
[Old]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Q.No.1 from section A & Q. No.6 from section B are compulsory.
- 2) Solve any two questions from remaining questions from each section.
- 3) Figure to right indicate full marks.
- 4) Use of non-programmable calculator & refrigerant tables is permitted.

Section A

- Q.1 Solve the following questions (any five): 10
- a) Write difference between Refrigerator & heat pump.
 - b) What do you mean by one tonne of refrigeration?
 - c) What do you mean by ODP and GWP?
 - d) What are different types of air refrigeration system?
 - e) What is the need of air-conditioning of air-crafts at high altitudes where ambient temperatures are very low?
 - f) What is compound refrigeration system employed when the condenser temperature to evaporator temperature range is very large?
- Q.2 A simple evaporative air cooling system is used for an aero plane to take 20 tonnes of load of refrigeration. The ambient air conditions are 20°C and 0.9 bar. The ambient air is rammed isentropic ally to a pressure of 1bar. The air leaving the main compressor at pressure 3.5 bar is first cooled in the heat exchanger having effectiveness of 0.6 and then in the evaporator where its temperature is reduced by 5°C. The air from the evaporator is passed through the cooling turbine and then it is supplied to the cabin which is to be maintained at a temperature of 25°C and at a pressure of 1.05 bar. If the internal efficiency of the compressor is 80% and that of cooling turbine is 75%, determine 15
1. Mass of air bled off the main compressor.
 2. Power required for refrigeration system.
 3. COP of the refrigeration system.
- Q.3 a) Describe the mechanism of a simple vapour compression refrigeration system. 05
- b) A commercial refrigerator operates with R-12 between 1.2 bar and 13.5 bar. The vapour is dry and saturated at the compressor inlet and saturated liquid after condensation. Assuming isentropic compression determine COP of the plant. Calculate the Power required to run the compressor to obtain a refrigerating capacity of 1TR. 10
- Q.4 Calculate the power needed to compress 20 Kg/min of R-12 from saturation vapor at 1.4 bar to a condensing pressure of 10 bar by two stage compression with inter-cooling by liquid refrigerant at 4 bar. Assume saturated liquid to leave the condenser & dry saturated vapor to leave the evaporator. 15

- Q.5 a) Write desirable properties of an ideal refrigerant in details. 05
 b) Explain working of Regenerative type of air-refrigeration system. 05
 c) Explain superheating and sub cooling of refrigerant in a vapor compression system with the help of P-H and T-S diagrams. 05

Section B

- Q.6 Answer any five of the following: 10
 a) Write a note on factors affecting comfort air conditioning.
 b) Define DBT and DPT.
 c) Write a short note on bypass factor for cooling coils.
 d) What is the use of analyzer in the vapour absorption system?
 e) Enlist different liquefaction system.
 f) What do you understand by Cryogenics?

- Q.7 a) Explain working of Electrolux Refrigeration system with the help of schematic diagram. 07
 b) Sketch & explain a cascade refrigeration system. Draw cascade refrigeration cycle on P-H & T-S diagram. 08

- Q.8 The readings from a sling psychrometer are as follows: 15
 Dry bulb temperature = 30°C, Wet bulb temperature = 20°C, Barometric reading = 740 mm of Hg.
 Using steam tables, find:
 1. Dew point temperature
 2. Relative humidity
 3. Specific humidity
 4. Degree of saturation
 5. Vapour Density
 6. Enthalpy of mixture per kg of dry air

- Q.9 A small office hall of 25 persons capacity is provided with summer air conditioning system with the following data: 15
 Outside conditions = 34°C DBT & 28°C WBT
 Inside conditions = 24°C DBT and 50% RH
 Volume of air supplied=0.4m³/min/person
 Sensible heat load in room = 125600 KJ/h
 Latend heat load in room =42000 KJ/h
 Find sensible heat factor of the plant.

- Q.10 a) Explain Claude system for liquefaction of air. 05
 b) Explain Hampson-Linde System of Gas liquefaction. 05
 c) Comparison of Vapour Absorption & Vapour compression refrigeration system. 05

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-1220
FACULTY OF SCIENCE AND TECHNOLOGY
Final .Tech.(Mech/Prod) (Sem-VII)
Automatic Control System
[OLD]

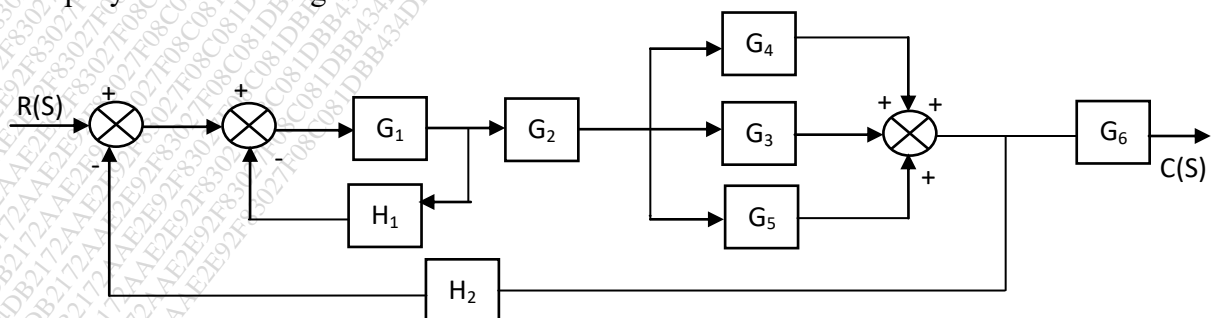
[Time: Three Hours]

[Max.Marks: 80]

- N.B
- Please check whether you have got the right question paper.
- 1) Q.No.1 from section A and Q.No.6 from section B are compulsory.
 - 2) Solve any two questions from remaining questions from each section.
 - 3) Assume suitable data, if required.

Section A

- Q.1 Answer any five of the followings: 10
- i) Define closed loop system.
 - ii) Draw and explain Block Diagram of a closed loop system.
 - iii) Define feedback path in a closed loop system.
 - iv) Describe Zeros and poles of a transfer Function.
 - v) Explain direct Analogy
 - vi) Enlist various components in a control system.
- Q.2 a) Derive a characteristic equation of a Electrical system [L-C-R] 08
 b) Derive a characteristic equation of Rotational Mechanical system. 07
- Q.3 a) Write a note on Gear Pump. 08
 b) Describe valves and their importance in Hydraulic system? Explain 2 way and 3 way directional control valves. 07
- Q.4 a) Explain Block Diagrams and its significance in control system? Describe the process of simplification of Blocks in:
 i) Parallel
 ii) Series 08
 b) Simplify the Block Diagrams and obtain its Transfer Function. 07



- Q.5 Write short notes on: (any three) 15
- i) Optical Encoder
 - ii) Pneumatic Flapper Mechanism
 - iii) Linear Mechanical System
 - iv) Pressure Control Relays

Section B

- Q.6 Answer any five of the followings: 10
- i) Define ON-OFF Controller
 - ii) Describe Response and its types
 - iii) Explain Stability and its importance
 - iv) Define a Takeoff point in a Block Diagram
 - v) Define a Second Order System
 - vi) Describe peak time and rise time.

- Q.7
- a) Write a note on Stepper Motor. 08
 - b) Define various modes of control? Explain PID control action with figure. 07

- Q.8
- a) What are standard test signals? Explain various standard test input signals with Figures. 08
 - b) Explain the Proportional (P) controller in detail. 07

- Q.9
- a) Describe Routh's Stability Criteria. 05
 - b) Explain Bodes Plot in detail? And describe the following in detail. 05
 - i) Gain Margine
 - ii) Phase Margine
 - iii) Stability of the system

- c) Check the stability of the system whose characteristic equation is as follows 05
- $$S^4 + 2S^3 + 3S^2 + 4S + 5 = 0$$

- Q.10 Write short notes on: (any three) 15
1. Derivative Controller
 2. Hydraulic Actuation System
 3. Pneumatic Cylinders
 4. Frequency Response

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-1254
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech.(Mech) (Sem-VII)
Heat Transfer
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.:
- 1) Assume suitable data if necessary.
 - 2) Question 1 and Question 6 are compulsory.
 - 3) Solve any Two questions from remaining in each section.
 - 4) Use of non-programmable calculator and heat transfer data book is permitted.
 - 5) Draw sketches and give suitable mathematical expressions wherever necessary.

Section -A

- Q.1 Attempt **any four** questions of the following. 12
- a) What is meant by Transient heat conduction?
 - b) What are the functions of insulating material?
 - c) Explain the term 'Thermal contact resistance'.
 - d) State Newton's law of cooling.
 - e) Write the effects of various parameters on the thermal conductivity of solids.
- Q.2 Derive 3D general heat conduction equation in cylindrical coordinates. 14
- Q.3
- a) A 15 mm diameter steel sphere ($k=42 \text{ W/m-K}$) is exposed to cooling airflow at 20°C resulting in the convective coefficient $h = 120 \text{ W/m}^2 - \text{K}$. Determine Time required to cool the sphere from 550°C to 90°C . Take, density of mild steel is 7850 kg/m^3 , Specific heat is 475 kJ/kg-K , Thermal diffusivity is $0.045 \text{ m}^2/\text{hr}$. 08
 - b) A furnace is made of a red brick wall of thickness 0.5m and conductivity 0.7 W/m-K . For the same heat loss and temperature drop, this can be replaced by a layer of diatomite earth of conductivity 0.14 W/m-K then what will be the thickness of diatomite earth layer. 06
- Q.4
- a) A finned surface consists of root or base area of 1 m^2 and fin surface area of 2 m^2 . The average heat transfer coefficient for finned surface is $20 \text{ W/m}^2\text{K}$. Effectiveness of fins provided is 0.75 . If finned surface with root or base temperature of 50°C is transferring heat to a fluid at 30°C , then what is the rate of heat transfer through the fin? 08
 - b) Consider heat transfer between two identical hot solid bodies and the air surrounding them. The first solid is being cooled by a fan while the second one can cool naturally. For which solid is the lumped system analysis more likely to be applicable? Why? 06
- Q.5
- a) A tube having inside diameter of 2 cm is maintained at uniform temperature T_1 and is covered with an insulation ($k=0.20 \text{ W/m.K}$) to reduce heat loss. Heat is dissipated from the outer surface of insulation by natural convection with $h_0 = 15 \text{ W/m}^2.\text{K}$ into the 08

ambient air at T_a . Determine the critical thickness of insulation, calculate the heat loss ratio from the tube with and without insulation for i) the thickness of insulation equal to the critical thickness and ii) the thickness of insulation 2 cm thicker than the critical thickness.

- b) Write a short note on 'Dielectric Heating'.

06

Section- B

Q.6 Attempt **any four** questions of the following.

12

- Explain the mechanism of Radiation heat transfer.
- Define the term emissive power. What is the difference in values of emissivity's of black body and white body?
- Differentiate between parallel flow and counter flow heat exchangers.
- State Stefan-Boltzmann's law.
- What is 'Stanton Number'?

Q.7 a) Sketch formation of boundary layer and show laminar, transition & turbulent flow. 06

- b) Air at 200 kPa and 200°C is heated as it flows through a tube with a diameter of 25 mm at a velocity of 10 m./sec. The wall temperature is maintained constant and is 20°C above the air temperature all along the length of tube. Calculate: (i) The rate of heat transfer per unit length of the tube. ii) Increase in the bulk temperature of air over a 3 m length of the tube. 08

Q.8 a) Explain the Reciprocity rule, Summation rule and Superposition rule and Symmetry rule in context with view factor. 08

- b) How does radiosity for a surface differ from the emitted energy? For what kind of surfaces are these two quantities identical? 06

Q.9 a) A parallel flow heat exchanger has hot and cold-water stream running through it, the flow rates are 20 and 50 kg/min respectively. Inlet temperatures are 100°C and 50°C on hot and cold sides. The exit temperature on the hot side should not exceed 50°C. Assume $h_i = h_o = 600 \text{ W/m}^2\text{K}$. Calculate the area of heat exchanger using E-NTU approach. 08

- b) Sketch temperature distribution graph for condensers & evaporators. 06

Q.10 a) Differentiate Opaque body & perfectly transparent surface. 04

- b) Consider a cylindrical furnace with r (Radius of top and base) = H (Height) = 1m. The top (surface 1) and the base (surface 2) of the furnace has emissivity of 0.8 and 0.4, respectively, and are maintained at uniform temperatures $T_1 = 700 \text{ K}$ and $T_2 = 500 \text{ K}$. The side surface (surface 3) closely approximates a blackbody and is maintained at a temperature of $T_3 = 400 \text{ K}$. Determine the net rate of radiation heat transfer at each surface during steady operation and explain how these surfaces can be maintained at specified temperatures? 10

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-1289
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Tool Design
[Old]

[Time: Four Hours]**[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B

All questions are compulsory N.B.

1. Question No.1 from section A and Q.No.6 from section B are compulsory.
2. Attempt any three questions from the each section.
3. Figures to the right indicate full marks.

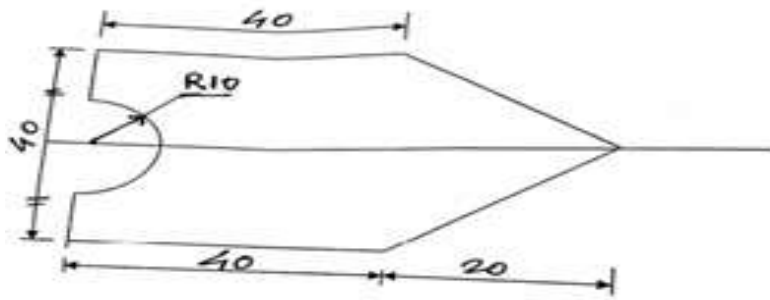
Section A

- Q.1 Attempt any five questions from the following. 10
- 1) What is meant by the term Tooling? List various types of tooling?
 - 2) Why are discontinuous types of chips preferred over the continuous types?
 - 3) Discuss the two methods of metal cutting?
 - 4) What are form tools?
 - 5) Define Fundamental deviation?
 - 6) State Taylor's principle of limit gauging?
- Q.2 a) In an orthogonal cutting operation, the following data have been observed: uncut chip thickness (t)= 0.127 mm, width of cut (b) = 6.35 mm, cutting speed (v) = 2 m/s, rake angle (α) = 10°, cutting force (F_c) = 567 N, thrust force (f_t) = 227 N, chip thickness (t_c) = 0.228 mm. determine 08
- 1) Shear angle
 - 2) Friction angle
 - 3) Shear stress along the shear plane
 - 4) Power for the cutting operation
 - 5) Shear strain in chip and shear rate
- b) A fit is designed as: 60 mm H7-h8, determine the minimum clearance and maximum clearance of the fit? The dia. Steps are 50mm & 80mm, IT8= 25i & IT 7 = 16 i? 07
- Q.3 a) How do you classify Broach, Sketch and discuss a typical internal broach nomenclature? 08
- b) A 25 mm H8-f7 fit is to be checked the limits of size for H8 hole are: High limit 25.033 mm 07
low limit 25.000 mm the limit of size for f7 shaft are High limit 24.980 mm low limit 24.959 mm taking gauge makers tolerance to be 10% of the works tolerance design plug gauges and gap gauges to check the fit?
- Q.4 a) Calculate the fundamental deviation, tolerances and hence the limits of sizes for the shaft and hole the following fit 70 mm H8-f7 the diameter steps are 50 mm and 80 mm 08
(Take IT8 = 25i, IT7 = 16i and fundamental deviation for shaft f is : ($-5.5D^{0.41}$))

- b) Explain in details Merchants force circle diagram and derive different relation? 07
- Q.5 a) Sketch, classify and discuss various types of gauges? 08
- b) A 300 mm diameter bar is turned at 45 rev/min, with depth of cut 2 mm & feed of 0.3 mm/rev the forces measured at the cutting tool point are; cutting force = 1850 N, feed force = 450 N; calculate 07
- i) Power consumption
 - ii) Specific cutting energy
 - iii) Energy consumed if the total metal removed during the Turning operation is $2.5 \times 10^6 \text{ mm}^3$

Section B

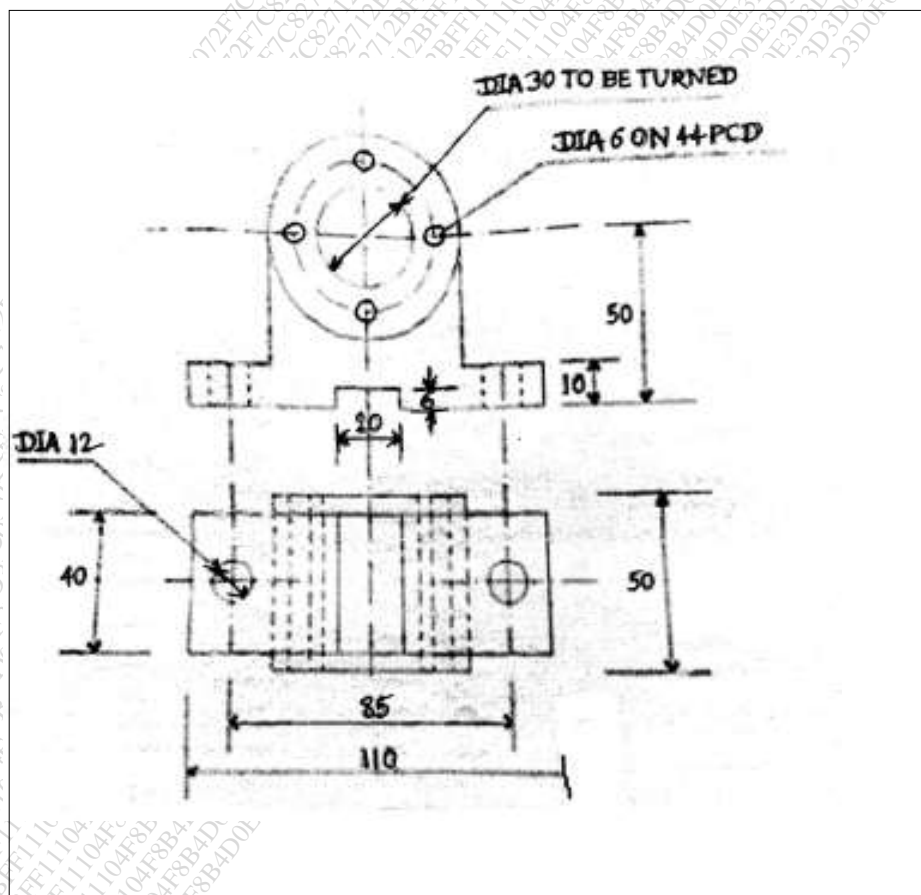
- Q.6 Attempt any five questions from the following. 10
- 1) What is fool proofing of jig and fixture? Give example?
 - 2) Describe the degree of freedom of a work piece located in space?
 - 3) What are the various ways in which dies can be classified?
 - 4) What is stock stop and pilot?
 - 5) What is the usual reduction for the first and succeeding draws?
 - 6) Differential between a blanking and a punching?
- Q.7 a) A washers with a 12.7 mm internal hole diameter and an outside diameter of 25.4 mm is to be made from 1.5 mm thick strip of 0.2 percent carbon steel consider the elastic recovery of the material. Find 08
- i) Clearance
 - ii) Blanking die-opening size
 - iii) Blanking punch size
 - iv) Piercing punch size
 - v) Piercing die opening size
- b) Differentiate between a Blanking die and Piercing die? 07
- Q.8 a) Define spring back and explain hoe allowances may be made to compensate for its harmful effects? 08
- b) What is mean by clearance? Why it is important in shearing operation? 07
- Q.9 Design and draw a compound or progressive die for the blank as shown in Figure 'II'? 15



All Dimension are in mm
Figure II

Q.10 Design, Draw and dimension a Turning fixture to turn Bore 30 diameter, in the work piece as shown in Figure 'I'. Assume Turning is the last operation?

15



All Dimension are in mm
Figure I

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-1325
FACULTY OF SCIENCE AND TECHNOLOGY
Final .Tech.(Mech/Prod) (Sem-VII)
Ele-II-Project Management & Operation Research
[OLD]

[Time: Three Hours]

[Max. Marks: 80]

N.B Please check whether you have got the right question paper.

- 1) Assume suitable data, if necessary.
- 2) Q.No.1 and Q.No.6 are compulsory.
- 3) Solve any two questions from remaining in each section.
- 4) Use of non-programmable calculator is allowed.

Section A

Q.1 Attempt any five:

10

- a) List the application of operation research in functional area of financial management.
- b) What are the methods used to arrive at an initial basic feasible solution to transportation model?
- c) State characteristics of LPP.
- d) Explain the steps involved in Simplex method.
- e) Write a note on Sensitivity analysis.
- f) Enlist any two model used in OR.

Q.2 A manufacturing company produces two products P1 and P2. Each product undergoes two operations 15 on machine M1 and M2. The time required to perform their operations with the available capacity of machine M1 and M2 in a given quarter are as given below: the market survey has predicted that not more than 450 units of product A and not more than 250 of product B can be sold in the given quarter. The company wants to determine the product mix to maximize profit. The unit profit for products A and B are Rs 20 and Rs 40 respectively.

Formulate the problem and solve graphically.

Machine	Product Time Reqd. per unit		Available Capacity (Hrs.)
	A	B	
M1	1.5 Hrs	1 Hr	750
M2	1 Hr.	3 Hrs.	900
Profit	Rs.20	Rs.40	

Q.3 a) Find the optimum solution to the following transportation problem in which the cell contains the transportation cost in rupees. Find IBFS using lowest cost entry method. 12

	W1	W2	W3	W4	W5	Available
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	15	20	5	

b) Also find out IBFS with North West corner method.

03

Q.4 Five lectures by experts are to be scheduled so as not to conflict with one another. The lectures are to be delivered in the afternoon on week days only, otherwise, because of other close schedules; certain students will be forced to drop out lectures. The following table or matrix indicates the number of absentees lecture wise and day wise schedule these lectures in such a way as to minimize the total number of students forced to remain absent.

Lecture	1	2	3	4	5
Day					
Mon.	3	2	3	9	10
Tues.	11	5	9	10	2
Wed.	1	3	8	2	4
Thurs.	8	11	10	5	2
Fri.	8	6	5	6	9

Q.5 a) A dealer wishes to purchase a number of fans & sewing machines. He has only Rs.5760 to invest & has space for 20 items only. A fan cost Rs.360 & a sewing machine cost Rs.240. he can sell a fan at a profit of Rs.22 and a sewing machine at a profit of Rs.18. assuming that he can sell all items that he buys, formulate the problem as a LPP and solve graphically

08

b) Solve the following assignment model

07

	A	B	C	D
1	18	26	17	11
2	13	28	14	26
3	38	19	18	15
4	19	26	24	10

Section B

Q.6 Solve any five of the following

- What is minimax and maximin value in game?
- State any two network analysis methods.
- What is mean by critical path?
- Explain any four terms related to queuing theory problems?
- How to convert three machine n job sequencing problem into two machine n job?
- State any two assumptions in queuing model.

10

Q.7 Reduce following game by dominance rule. 15

	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

Q.8 There are seven jobs, each of which is to be processed through 03 machines: A, B and C in the order. Find the sequence of jobs, total elapsed time and idle time of each machine. 15

Machine	Task						
	1	2	3	4	5	6	7
M _A	12	6	5	3	5	7	6
M _B	7	8	9	8	7	8	3
M _C	3	4	11	5	2	8	4

Q.9 a) The arrival rate of a customer at a service window of a cinema hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with a mean of 60 per hour. Find 10

1. Average number of customer in the system (Ls)
2. The average queue length (Lq)
3. The average waiting time in the system. (Ws)
4. The average waiting time in the queue (Wq)

b) Explain Kendal's notations in queuing problem. 05

Q.10 A project consists of the following activities. Find the optimum project time & corresponding minimum total project cost by crashing appropriate activities indirect cost per day is Rs.400. draw project network. 15

Activity	Time (Weeks)		Cost (Rs.)	
	Normal	Crash	Normal	Crash
1-2	9	4	1300	2400
1-3	15	13	1000	1380
2-3	7	4	7000	7540
2-4	7	3	1200	1920
2-5	12	6	1700	2240
3-6	12	11	600	700
4-5	6	2	1000	1600
5-6	9	6	900	1200

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-4002
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Tool Design
[Revised]

[Time: Three Hours]**[Max.Marks: 80]**

Please check whether you have got the right question paper.

- N.B
- 1) Q.1 and Q.6 are compulsory. Solve any two questions from remaining from each Section.
 - 2) Draw neat sketches wherever necessary.
 - 3) Use of non-programmable calculator is allowed.

Section A

- Q.1 Attempt any five: 10
- 1) What is tool signature?
 - 2) What are applications of D steels ?
 - 3) State any two desirable properties of cutting fluid.
 - 4) State any two applications of clearance fit.
 - 5) Define tool life in any two ways.
 - 6) State any two elements of single point cutting tool.
- Q.2 08
- a) Derive the relation between shear angle and chip thickness ratio.
 - b) Derive the relation between three velocities in metal cutting. 07
- Q.3 08
- a) In an orthogonal cutting operation, the following data have been observed.

Uncut chip thickness	$t=0.127$ mm
Width of cut	$b=6.35$ mm
Cutting speed	$v= 2$ m/s
Rake angle	$\alpha = 10^\circ$
Cutting force	$F_c=567$ N
Thrust force	$F_t=227$ N
Chip thickness	$t_c=0.228$ mm

 Determine: shear angle, the friction angle, shear stress along the shear plane and the power for the cutting operation. 07
 - b) Describe different types of cutting fluids. 07
- Q.4 Describe Merchant's force circle diagram for finding various forces in metal cutting. 15
- Q.5 Write short notes (Any three) 15
- i) Geometry of drill & nomenclature
 - ii) Different types of fits
 - iii) Types of gauges
 - iv) Taylor's principle of gauge design.

Section B

- Q.6 Attempt any five: 10
- i) Differentiate between 3-2-1 & 4-2-1 principle.
 - ii) State exact difference between jig & fixture.
 - iii) Which is compound die?
 - iv) Difference between Blanking & piercing.
 - v) State importance of centre of pressure in dies.
 - vi) Define drawing die.
- Q.7 Design, draw and dimension a drill jig to drill the two holes of dia. 10 mm in the component shown in figure –I. 15
Assume all other operations are done except the last two holes.
- Q.8 Design, draw and dimension a milling fixture of mill a slot 6mm wide in the component shown in figure-II. Assume slot milling the Last operation. 15
- Q.9 08
a) Describe various methods of reducing cutting forces in press tools. 07
b) What is knockout? Explain its function.
- Q.10 Write short note (any three) 15
- a) Stripper
 - b) Principles of clamping
 - c) Drawing die
 - d) Single & double acting drawing die

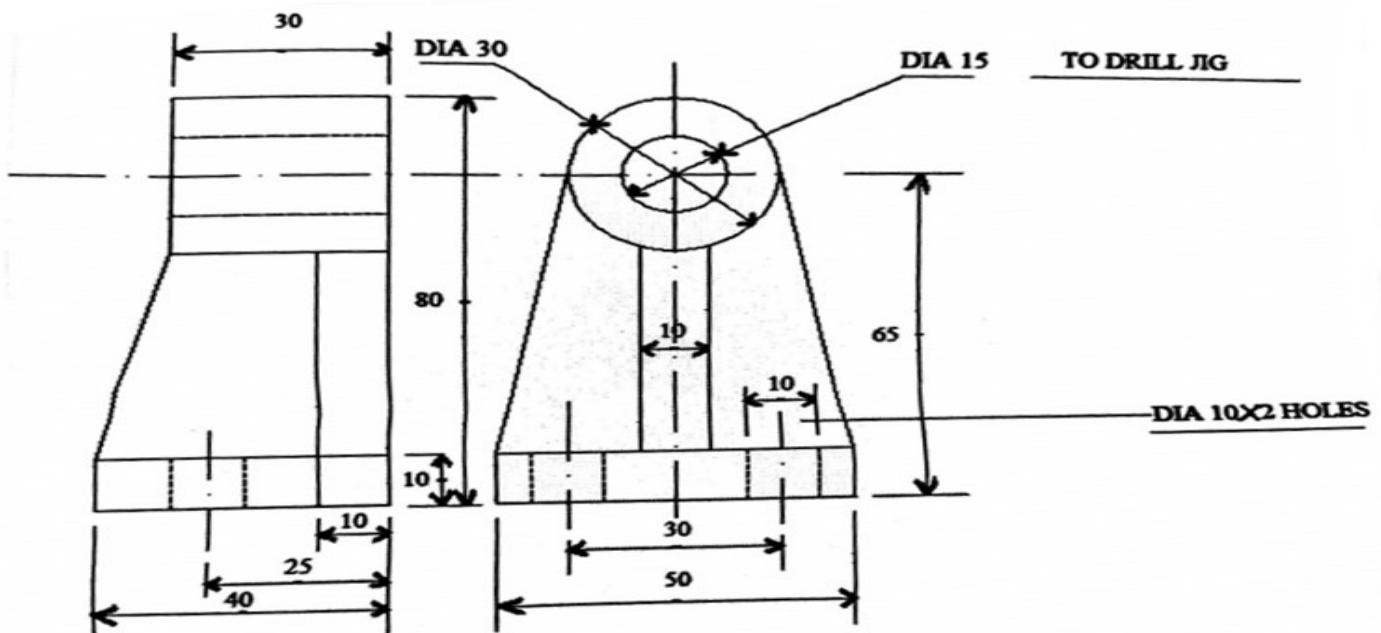


Figure.1

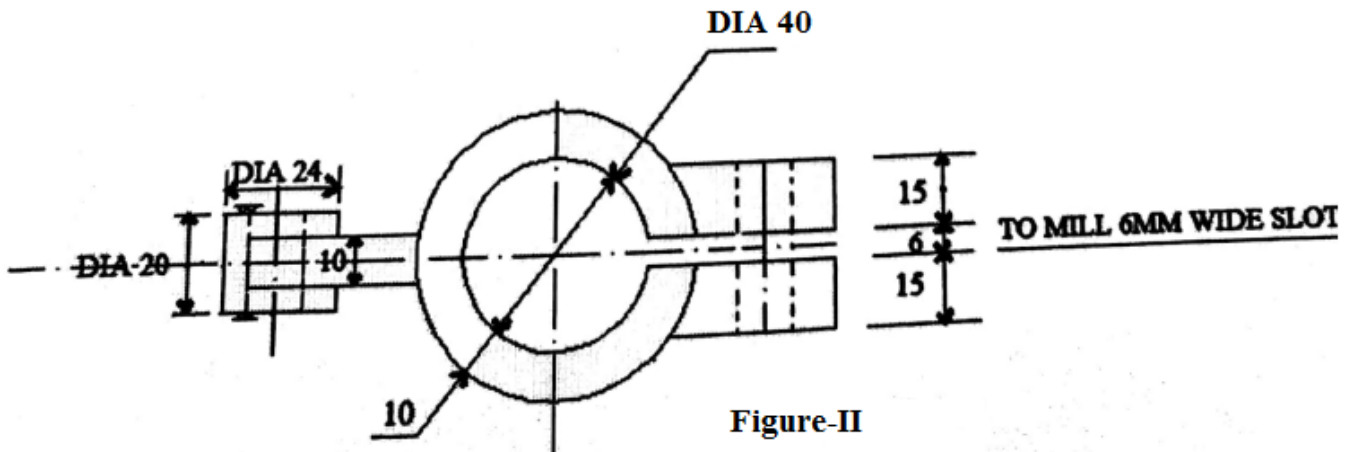
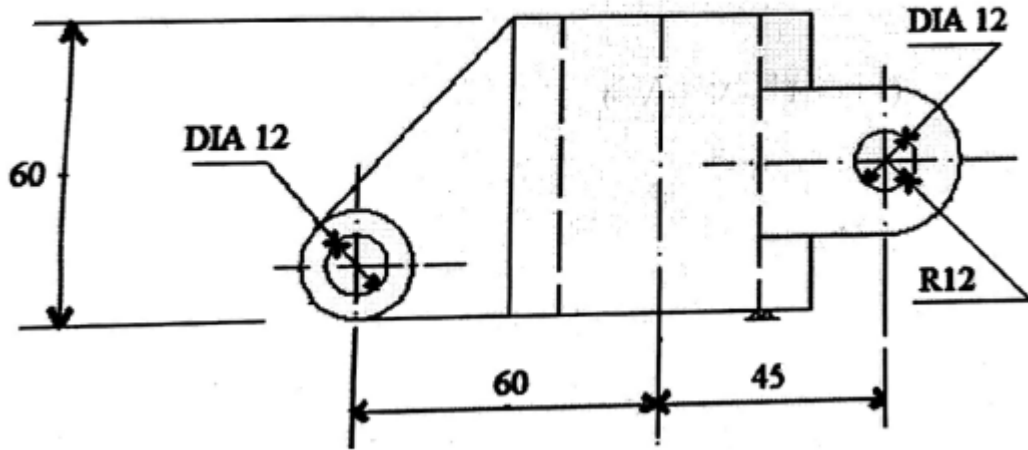


Figure-II

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-4009
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech.) (Sem-VII)
Automatic Control System
[Revised]

[Time: Three Hours]

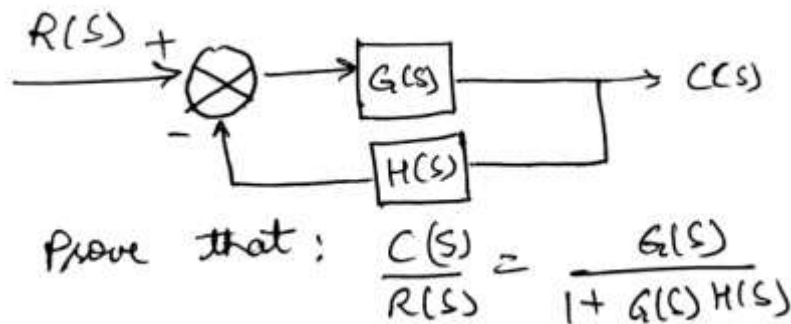
[Max.Marks: 80]

Please check whether you have got the right question paper.

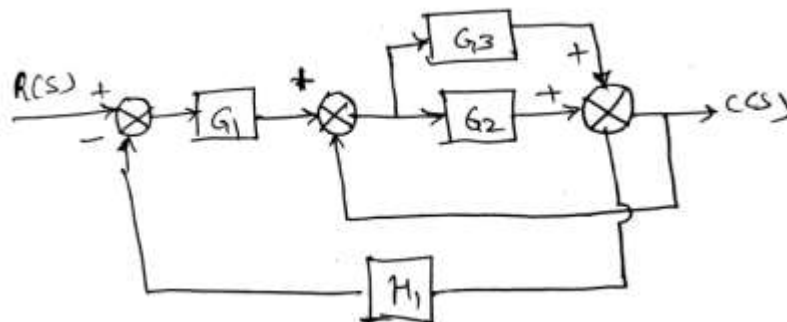
- N.B
- 1) Question no. 1 from Section A and Question no. 6 from Section B are compulsory.
 - 2) Solve any twoquestions from remaining questions from each Section.

Section A

- Q.1 Solve any five of the following: 10
- 1) Explain open loop and closed loop system.
 - 2) Enlist advantages of Block diagram.
 - 3) Describe transfer function.
 - 4) What are the different types of control action?
 - 5) Draw block diagram of a closed loop system.
 - 6) Define one pressure measuring device.
- Q.2 a) For the control system shown in figure below. 08



- b) Find the closed loop transfer function by reducing the block diagram shown below: 07



- Q.3 a) Describe construction and working of Vane Pump. 07
 b) Explain in detail the following: 08
 i) Direct analogy
 ii) Indirect analogy
- Q.4 a) Explain construction and working of 3 way and 4 way hydraulic valve. 07
 b) Write a note on LVDT. 08
- Q.5 Write short note on any three: 15
 1) Optical Encoder
 2) Blocks in cascade
 3) Stepper motor
 4) Thermocouple

Section B

- Q.6 Solve any five of the following: 10
 1) Give example of ON-OFF controller.
 2) Describe take off point in Block diagram.
 3) What are zeros and poles of transfer function?
 4) Define stability for a control system.
 5) Describe the proportional control action.
 6) Describe second order system.
- Q.7 a) Define response of a system? Explain transient and steady state response. 03
 b) Explain PID control action in detail with figure. 12
- Q.8 a) Define the following i) Step Input 03
 ii) Ramp input
 iii) Impulse input
 b) The open loop transfer function of a unity feedback control system is given by 12

$$G(S) = \frac{25}{S(S + 5)}$$
 Obtain maximum overshoot, peak time, rise time and settling time.

- Q.9 a) Determine the stability of a system whose characteristic equation is given by 03

$$S^4 + 2S^3 + 3S^2 + 4S + 5 = 0$$

 b) Draw the Bode plot for the transfer function 12

$$G(S) = \frac{16(1 + 0.5S)}{S^2(1 + 0.125S)(1 + 0.1S)}$$
 From the graph determine:
 i) Phase Crossover frequency
 ii) Gain Crossover frequency
 iii) P.M
 iv) G.M
 v) Stability of the system

Q.10 Write short note on any three:

- 1) Modes of control
- 2) Bellows
- 3) Frequency response
- 4) Derivative control action

Total No. of Printed Pages:5

SUBJECT CODE NO:- H-4016
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Refrigeration and Cryogenics
[Revised]

[Time: Three Hours]

[Max. Marks:80]

- N.B
- Please check whether you have got the right question paper.
- (i) Question number 1 and 6 are compulsory, answer remaining any two questions from each section.
 - (ii) Refrigeration properties tables and charts are allowed.
 - (iii) Figures to the right indicates full marks.
 - (iv) Assume suitable data, if necessary.

SECTION - A

Q.1 Choose correct answer of the following (any five) (10)

1. One tone of refrigeration implies that the machine has refrigerating effect (capacity of heat extraction from the system being cooled) equal to
 - (a) 210 kJ/s
 - (b) 210 kJ/min
 - (c) 210 kJ/hr
 - (d) 210 kJ/day
2. The capacity of the refrigerating machine is expressed as
 - (a) Inside volume of cabinet
 - (b) Lowest temperature attained
 - (c) Gross weight of machine in tons
 - (d) Rate of abstraction of heat from space being cooled
3. Carnot refrigerator extracts 500 kJ of heat per minute from cold room which is maintained at -10°C and it is discharged to atmosphere at 35°C . The power required to run the refrigerator is
 - i) 2.25 kW
 - ii) 1.425 kW
 - iii) 2.75 kW
 - iv) 1.5 kW
4. In vapour compression refrigeration system, liquid to suction heat exchanger is used to
 - (a) Keep the COP constant
 - (b) Prevent the liquid refrigerant from entering the compressor
 - (c) Subcool the liquid refrigerant leaving
 - (d) Subcool the vapour refrigerant from the evaporator

5. Which of the following component is common between vapour compression and vapour absorption systems?
 - (a) Absorber
 - (b) Generator
 - (c) Condenser
 - (d) Rectifier

6. Why is the flash chamber in the refrigeration circuit installed?
 - (a) To reduce the pressure losses through the evaporator
 - (b) To reduce the size of evaporator by avoiding vapour going to evaporator
 - (c) To improve overall heat transfer coefficient.
 - (d) All of the above

7. The refrigerant R-290 stands for
 - (a) C_2H_4
 - (b) C_2H_8
 - (c) C_2H_{10}
 - (d) C_2H_{12}

Q.2 For an R-12 simple vapour compression refrigeration system operating temperature limits of $-15^\circ C$ evaporator temperature and $40^\circ C$ condenser temperature. There is no under cooling and superheating of vapour. If the condenser temperature increased by $5^\circ C$ and evaporator temperature reduced to $-10^\circ C$. (15)

Determine following for both cases

- (i) COP of the system
- (ii) Mass flow rate of refrigerant
- (iii) Theoretical piston displacement.

Assume the capacity of plant 10TR.

Q.3 A two-stage refrigeration system works between the temperature limits of $40^\circ C$ and $-15^\circ C$ as shown in figure 1. Obtain the COP and capacity for a flow rate of 0.2 kg/s through the evaporator. The intermediate pressure is 4.0 bar. Compare the COP and capacity of the two-stage system with corresponding to single-stage operating between the above temperature limit. The refrigerant used in R-12. (15)

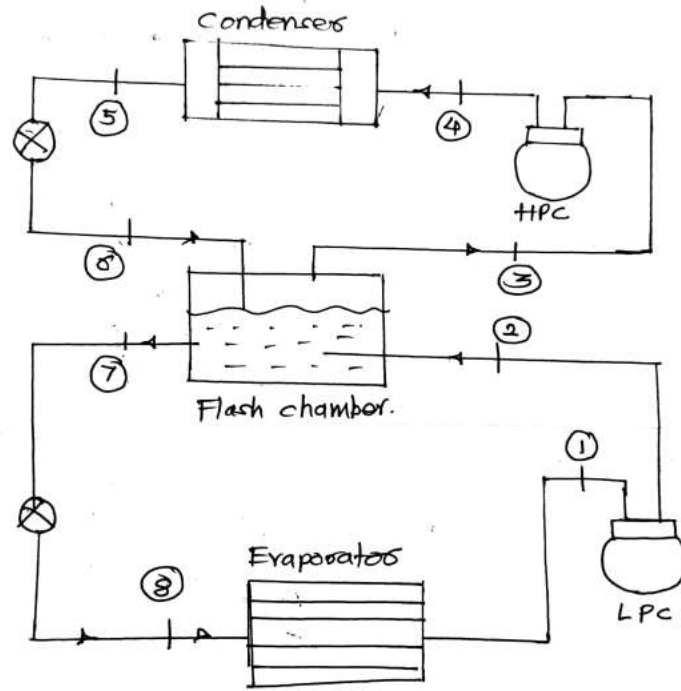


Figure 1.0

- Q.4 (a) Make the comparative list between a vapour absorption refrigeration system and vapour compression system. (07)
- (b) Define a 'refrigerant' and explain how are the refrigerants classified and designated? (08)
- Q.5 Write descriptive notes on (any three) (15)
1. Effect of superheating and subcooling on performance of refrigeration system
 2. Steam jet refrigeration system
 3. Magnetic refrigeration system
 4. ODP and GWP.

SECTION B

- Q.6 Choose correct answer of the followings (any five) 10
1. Reversed Carnot cycle comprises
 - (a) Two-isentropic processes and two adiabatic processes.
 - (b) Two isentropic processes and two isothermal processes
 - (c) Two isentropic processes and two constant pressure processes
 - (d) Two isentropic processes and two constant volume processes
 2. A boot strap air cooling system has
 - (a) One heat exchanger
 - (b) Two heat exchanger
 - (c) Three heat exchanger
 - (d) Four heat exchanger

3. Dry ice is
 - (a) Solidified carbon dioxide
 - (b) Ice free from dissolved air and gases
 - (c) Ice free from impurities
 - (d) None of the above
4. Cascade refrigeration system is applicable to
 - (a) Air refrigeration
 - (b) Vapour compression refrigeration
 - (c) Vapour absorption refrigeration
 - (d) None of the above
5. Cryogenics deals with the temperature lower than-----
 - (a) -50°C
 - (b) -100°C
 - (c) -150°C
 - (d) All of the above
6. The location of freezer in the top portion of refrigerator results in
 - (a) Less noise in the system
 - (b) Quick cooling of entire system
 - (c) No overheating of the motor
 - (d) No adverse effect on the environment
7. Global warming is caused by
 - (a) Ozone
 - (b) Carbon dioxide
 - (c) Nitrogen
 - (d) Carbon monoxide

Q.6. A cascade refrigeration system is designed to supply 9 tonnes of refrigeration at an evaporator temperature of -60°C and a condenser temperature of 25°C . The load at -60°C is absorbed by a unit using R-22 as the refrigerant and rejected to a cascade condenser at -20°C . The cascade condenser is cooled by a unit using R-12 as the refrigerant and operating between -30°C evaporating temperature and 25°C , but there is no subcooling of R-12 refrigerant. The gas leaving both the evaporators is dry and saturated and compression is isentropic. Neglecting losses determine: (15)

- (a) Compression ratio of each unit
- (b) Quantity of refrigerant circulated per minute for each unit.
- (c) COP of each unit

- (d) COP of whole unit
- (e) Theoretical power required to run the system.

Q.7 The following data refer to simple aircraft refrigeration system: (15)

Ram air temperature and pressure: 30°C and 1.05 bar

Cabin air temperature and pressure: 27°C and 1.0 bar

Pressure at the exit of main compressor: 4.5 bar

Effectiveness of heat exchanger: 0.8

Compressor efficiency: 0.84

Turbine efficiency: 0.78

Cooling load: 20 kW.

Determine:

- a) Capacity of plant in TR
- b) Mass of air bled from the main compressor for refrigeration.
- c) Heat rejected through the condenser.
- d) Power supplied to main compressor.
- e) COP of the system

Q.8 (a) What is mean by preservation of food? What are different methods of food preservation? (07)

Explain one method of food preservation in detail.

(b) Explain with neat sketch pre cooled Claude system used for liquefaction of hydrogen. (08)

Q.9 (a) What are the limitations of vapour compression refrigeration system to achieve low temperatures? (07)

(b) What is Joule-Thomson effect; Joule Thomson coefficient and inversion curve? (08)

Q.10 Write descriptive notes (any three) (15)

- (a) Domestic Refrigerator
- (b) Application of cryogenics in cryosurgery
- (c) Boot strap refrigeration system
- (d) Dry ice production

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-4023
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Open Elective-II
Operations Research
[Revised]

[Time: Three Hours]

[Max.Marks: 80]

N.B Please check whether you have got the right question paper.
 1)Q 1 from Section A &Q6 from Section B are compulsory.
 2) Solve any two questions from each section other than Q1 & Q6.
 3) Assume suitable data, if required.

Section A

Q.1 Attempt any five: 10
 1. What is the role of O.R in Engineering?
 2. What is Iterative procedure?
 3. What are the characteristics of linear programming problem?
 4. Define slack variables.
 5. What is the relation between assignment and transportation problem?
 6. What is an unbalanced transportation problem?
 7. Write a historical note in brief about Operation Research?

Q.2 a) An aero plane can carry a maximum of 250 passengers. A profit of Rs. 1500 is made on each executive class ticket & a profit of Rs. 900 is made on each economy class ticket. The airline reserves at least 30 seats for executive class. However at least 4 times as many passengers prefer to travel by economy class then by executive class. Formulate this problem as a LPP & solve graphically. 10
 b) Explain the phases of O.R. 05

Q.3 Solve the following LPP by simplex method. 15
 Maximize $Z = 4X_1 + 3X_2$
 Subject to constraints,
 $3X_1 + 6X_2 \leq 18$
 $6X_1 + 4X_2 \leq 24$
 $X_1, X_2 \geq 0$

Q.4 Table below shows unit transportation cost from various go-downs to market area with their capacity & requirements. Find IBFS using Vogel's approximation method & also find the optimum solution. 15

	M1	M2	M3	M4	Capacity
G1	15	20	22	24	100
G2	18	17	12	10	200
G3	11	9	5	13	250
Requirement	75	75	275	125	

Q.5 Five new machines are to be located in a machine shop; there are five possible locations in which the machine can be located. The cost of placing machine at various locations is given in the table below: 15

	Location 1	Location 2	Location 3	Location 4	Location 5
Machine 1	20	23	18	10	16
Machine 2	50	20	17	16	15
Machine 3	60	30	40	55	8
Machine 4	6	7	10	20	25
Machine 5	18	19	28	17	60

It is required to place the machine at suitable location so as to minimize the total cost.

- A) Formulate an L.P model to find an optimal assignment.
- B) Solve the following assignment problem for minimum optimal cost.

Section B

Q.6 Attempt any five: 10

- 1) Explain pure and mixed strategy.
- 2) What is meant by Queue Discipline?
- 3) Define idle time on a machine in a sequencing problem.
- 4) What is economical order quantity?
- 5) What is the difference between individual and group replacement?
- 6) What is meant by critical path?
- 7) Define event float in CPM.

Q.7 a) A firm is considering replacement of a machine, whose cost is Rs. 12,200/- and the Scrap Value is Rs.200/- The running (Maintenance and operating) cost in rupees are found from experience to be as follows. When should the machine be replaced? 08

Year	1	2	3	4	5	6	7	8
Running Cost (Rs)	200	500	800	1200	1800	2500	3200	4000

b) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at RS. 50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find (a) the economic lot size (b) No. of orders per year. 07

Q.8 a) Determine the optimum strategies and the value of the following games. 08

	B			
A	-3	4	2	9
	7	8	6	10
	6	2	4	-1

b) Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order A-B-C as shown in the below table. Also find the total elapsed time. 07

Machine	Job					
	1	2	3	4	5	6
A	8	3	7	2	5	1
B	3	4	5	2	1	6
C	8	7	6	9	10	9

- Q.9 a) The arrival rate of a customer at a service window of a cinema hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with a mean of 60 per hour. Find. 08
- 1) Average number of customer in the system (Ls)
 - 2) The average queue length (Lq)
 - 3) The average waiting time in the system (Ws)
 - 4) The average waiting time in the queue (Wq)
- b) Draw the network diagram, calculate the EST and LFT, total float and project duration and show critical path on network for following data. 07

Activity	Time in days	Pre-operation
A	5	None
B	6	A
C	5	B
D	4	A
E	3	D
F	4	C,E

- Q.10 For a project, normal time, crash time, normal cost and crash costs are given in the table. Contract the network by crashing it to optimum value and calculate the optimum project cost. Indirect cost is given as Rs. 100/- per day. 15

Activity	Time (days)		Cost (Rs)	
	Normal	Crash	Normal	Crash
1-2	3	2	300	400
2-3	6	4	480	520
2-4	7	5	2100	2500
2-5	8	6	400	600
3-4	4	3	320	360
4-5	5	4	500	520

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-4032
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech.) (Sem-VII)
Elective-III Automobile Engineering
[Revised]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- 1) Question No. 01 from section A and Question No. 06 from section B is compulsory.
 - 2) Attempt any three questions form each section.
 - 3) Figure to the right indicates full marks.

Section -A

- Q.1 Solve any five questions form the following 10
- 1) State major types of automobiles?
 - 2) List any four components of a power unit of an automobile?
 - 3) Distinguish between water and air cooling?
 - 4) What is mean by mist lubrication system?
 - 5) What is universal joint? Where it is used in automobile vehicle?
 - 6) State the function of rear axle?
- Q.2 A) Draw the layout of an all-wheel driven automobile vehicle and explain the various components of the same? 07
- B) Explain in detail about Synchronesh Gear Box with neat sketch? 08
- Q.3 A) With neat sketch explain any two types of cooling system used in automobile vehicle, and state the requirement of cooling system? 07
- B) What are the features of a good quality clutch? Explain the working of multi plate clutch with a neat sketch? 08
- Q.4 A) What is the need of using a differential assembly? Discuss different types of differentials? 07
- B) What is petrol injection system? What are its advantages and disadvantages? 08
- Q.5 A) Sketch a mechanical fuel pump and describe its working? 07
- B) What is the need of lubrication in an automobile? Explain the working of lubrication system used in automobile engine with neat a sketch? 08

Section B

- Q.6 Solve any five questions from the following 10
- 1) Classify steering system?
 - 2) What is mean by Centre point steering?
 - 3) What is mean by bleeding of brakes?
 - 4) Classify independent rear suspension system.
 - 5) Enlist different types of Brakes?

- 6) What are the different materials used for chassis frames?
- Q.7 A) Explain various steering geometries with the help of neat sketch? 07
 B) Explain the construction, working principle and application of Hydraulic braking system with neat a sketch? 08
- Q.8 A) With neat a sketch explain the working principles of pneumatic braking system? 07
 B) What do you understand by the directional stability of a vehicle? Briefly describe the factors on which it depends? 08
- Q.9 A) How do you classify Chassis? Explain in detail? 07
 B) Explain Ackermann Principle of steering with neat a sketch? 08
- Q.10 A) List and explain various automobile components that are mounted on a chassis? 07
 B) Explain briefly the elements of a suspension system and discuss the bouncing, rolling and pitching suspension movement of a cars? 08

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-4053
FACULTY OF SCIENCE AND TECHNOLOGY
Final B. Tech (Mech.) (Sem-VII)
Elective –IV HVAC (Heating Ventilation and Air Conditioning)
(Revised)

[Time: Two Hours]

[Max. Marks: 40]

Please check whether you have got the right question paper.

- N.B
- 1) Q.No.1 from section A and Q.No.6 from Section B are compulsory.
 - 2) Solve any two questions from the remaining questions in each section.
 - 3) Use of Refrigeration data book is allowed.
 - 4) Use of non-programmable calculator is allowed.
 - 5) Assume suitable data, if necessary and state them clearly.

Section A

- Q.1 Attempt any three of the following: 06
- 1) Define Enthalpy.
 - 2) What is sensible heating and sensible cooling in air conditioning processes?
 - 3) What is dew point temperature?
 - 4) State Newton's law of cooling
 - 5) State first law of thermodynamics.
- Q.2 03
- a) Elaborate the scope of HVAC.
 - b) Explain sensible heat and latent heat in details. 04
- Q.3 03
- a) Explain adiabatic mixing of two air streams in details with neat sketch.
 - b) Explain cooling with dehumidification and heating with humidification process in details. 04
- Q.4 What is moist air? Explain different properties of moist air involved in air conditioning process. 07
- Q.5 03
- a) What is Temperature? Define temperature scale.
 - b) Explain evaporative cooling process with diagram. 04

Section B

- Q.6 Attempt any three of the following: 06
- a) What are the different source of heat gain in a building?
 - b) What is duct used in air distribution and ventilation system?
 - c) What is by-pass factor?
 - d) What is AHU?
 - e) What is the condition for alignment circle?
- Q.7 The amount of air supplied to an air conditioned hall is 300m³/min. The atmospheric conditions are 35°C DBT and 55% RH. The required condition are 20°C DBT and 60% RH. Find out the sensible heat and latent heat removed from the air per minute. Also find sensible heat factor for the system. 07

- Q.8 Explain various components which are used in air distribution and ventilation system in details with 07 diagram.
- Q.9 a) What is the sequence of operation of HVAC? 03
b) Explain the process for installation of chiller and AHU. 04
- Q.10 Explain air distribution and ventilation system used in various public places. 07

Total No. of Printed Pages:1

SUBJECT CODE NO:- H-4055
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech.) (Sem-VII)
Elective -IV
Industry 4.0
[Revised]

[Time: Two Hours]

[Max.Marks:40]

- N.B Please check whether you have got the right question paper.
- 1) Figures to the right indicate full marks.
 - 2) Q.1 and Q.5 are compulsory.
 - 3) Attempt any two questions from the remaining questions from each section.

SECTION A

- | | | |
|-----|--|----------|
| Q.1 | Answer the following questions (Any Three).
a) What are the 4 types of industrial revolutions?
b) Give any four applications of Bluetooth connectivity.
c) Which are the subtasks involved in controlling the Autonomous Robots?
d) What is Artificial Intelligence? | 06 |
| Q.2 | Discuss the benefits of Industry 4.0 implementation. | 07 |
| Q.3 | a) What impacts will the Internet of Things (IoT) have on infrastructure and smart cities sector?
b) What are the main challenges of Internet of Things (IoT)? | 04
03 |
| Q.4 | a) Explain the features of Cyber Physical Systems.
b) Which are the requirements for Robots in Intelligent Environments? | 04
03 |

SECTION B

- | | | |
|-----|---|----------|
| Q.5 | Answer the following questions (Any Three).
a) What is Big Data Analytics?
b) What is Social sustainability?
c) List out any four skills requirements in industry 4.0.
d) Why to use Hadoop for data analytics? | 06 |
| Q.6 | a) What is a resource-based view? Discuss with sketch.
b) What is role of big data analytics in Industry 4.0? | 04
03 |
| Q.7 | How circular economy can be implemented in industry? | 07 |
| Q.8 | How E-commerce will help to improve the customer services in context of Industry 4.0? | 07 |

Total No. of Printed Pages: 02

SUBJECT CODE NO:- H-647
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Elective-I Mechatronics
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
1. Question No. 1 & question no.6 are compulsory.
 2. Solve any two question from Q. no. 2 to Q. no. 5
 3. Solve any two question from Q. no. 7 to Q. no .10
 4. Assume suitable data if necessary.

Section A

- Q.1 Attempt any two from the following. 10
- a) Types of Data Acquisition systems
 - b) Optical sensors use in mechatronics
 - c) Lab view based DAS systems.
 - d) Load cell.
- Q.2 a) Explain construction and working of photo voltaic cell and its use in solar panel? 07
b) Derive expression for gauge factor of strain Gauge and explain working of strain gauge? 08
- Q.3 a) Explain significance of data Acquisition systems? 07
b) Suggest suitable hydraulic circuits for counterbalancing of particular weight and draw the circuit with standard symbol. 08
- Q.4 a) Construct a simple circuit diagram for auto reversing of the double acting pneumatic cylinder. 07
b) Enlist the basic components of hydraulic circuit and give the application of each component in circuit. 08
- Q.5 Write short notes on any three. 15
- a) Accelerometer Sensors.
 - b) Torque sensors principle of operation
 - c) Pressure sensor working principle
 - d) Motion sensor use in mechatronics systems.

Section B

- Q.6 Attempt any two from the following. 10
- a) Selection criteria of PLC.
 - b) Hardware in loop model.
 - c) Micro sensor working
 - d) Components used in Mechatronics systems.

- Q.7 a) How one should select PLC according to its selection criterion? 07
 b) Draw an one line diagram by using three switch (S1, S2, S3) such that when all the toggle switch is made ON an output indicator lamp gets ON and when any of the toggle switch is made OFF the output gets OFF. 08
- Q.8 a) Explain in brief AD/DA converters with block diagram and truth table. 07
 b) Explain principle working and importance of Microcontrollers with its block diagram? 08
- Q.9 a) Make different types of logic gates using ladder logic? 07
 b) Explain condition monitoring as advance application in mechatronics 08
- Q.10 Write short notes on any three. 15
 a) Fuzzy logic application in Mechatronics
 b) Different hardware's used in mechatronics
 c) Artificial intelligence in Mechatronics
 d) Ladder Programming in Industrial application.

Total No. of Printed Pages:1

SUBJECT CODE NO:- H-495
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Robotics and Industrial Automation [Elective-II]
(Revised)

[Time:Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B 1. Answer any three questions from each section.
- Section A
- Q.1 a) Explain different types of drives used in robots. 07
b) Write about merits and demerits of Hydraulic drive. 06
- Q.2 a) Explain the application of robot in assembly & inspection. 07
b) With the help of suitable sketch, explain off line programming method of a robot. 06
- Q.3 a) Explain Trajectory Planning. 07
b) Explain importance of Work envelops. 06
- Q.4 a) Define Touch sensors. What are their application? 07
b) Explain the concept of image acquisition and illumination techniques in vision system of a robot. 06
- Q.5 Write short note on any two 14
a) Robot Kinematics
b) Robotic joints
c) Proximity sensors
- Section B
- Q.6 a) What are different types of automation? 07
b) Explain optical inspection methods? 06
- Q.7 a) Write about basic PLC programming. 07
b) Describe various industrial control applications. 06
- Q.8 a) Explain Logic Control and Sequencing in PLC. 07
b) Compare Process Industries and Discrete-Manufacturing Industries. 06
- Q.9 a) What is Automated Material Handling and Storage Systems? 07
b) Explain Building blocks of Automation. 06
- Q.10 Write short note on any two 14
a) AGV
b) FMS
c) Automatic visual inspection

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-616
FACULTY OF SCIENCE & TECHNOLOGY
B.E. (Mechanical) (CGPA) (Sem-I)
I.C. Engines and Gas Turbines

[Time: Three Hours]**[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B

- (i) Question 1 and 6 are compulsory.
- (ii) From remaining four questions, attempt any two from each Section.
- (iii) Use of non-programmable calculator is allowed.
- (iv) Neat diagrams must be drawn wherever necessary.
- (v) Figures to the right indicate full marks.
- (vi) Assume suitable data, if necessary.

Section A

- | | | |
|-----|--|----|
| Q.1 | Answer the following questions. | 10 |
| | (a) Compare air standard, fuel air and actual cycle. | |
| | (b) Draw valve timing diagram of 2S engine. | |
| | (c) Draw types of combustion chamber of CI engine. | |
| | (d) Explain fuel rating. | |
| | (e) What are the fuel additives? | |
| Q.2 | (a) Explain air fuel ratio and power output with respect to throttle opening position. | 08 |
| | (b) Explain in detail the losses in actual cycle. | 07 |
| Q.3 | (a) What are the factors affecting detonation? Explain in detail. | 07 |
| | (b) What is the importance of combustion chamber in SI engine? Explain in detail with neat sketch. | 08 |
| Q.4 | (a) Explain the factors affecting ignition delay in CI engine. | 07 |
| | (b) What are the stages of combustion in CI engine? Explain with neat sketch. | 08 |
| Q.5 | Write short notes on any TWO: | 15 |
| | a. Governors. | |
| | b. Diesel Knock. | |
| | c. Direct and indirect injection. | |

Section B

- | | | |
|-----|---|----|
| Q.6 | Answer the following questions. | 10 |
| | (a) Define brake, indicated and frictional power. | |
| | (b) Explain in short MPFL. | |
| | (c) Explain the disadvantages of gas turbine. | |
| | (d) Explain the effect of regeneration. | |
| | (e) Explain in short the emission norms. | |

- Q.7 (a) What are the variables effecting performance characteristics? 08
 (b) Explain the methods of calculation of engine power. 07
- Q.8 (a) Explain variable valve timing engines. 08
 (b) What are the emission characteristics of engine and control technologies? 07
- Q.9 (a) Explain the methods of improvements of thermal efficiency of gas turbine. 08
 (b) Explain the effect of intercooling and reheating. 07
- Q.10 Write explanatory notes on any TWO: 15
- a. Heat balance of engine.
 - b. CRDI system.
 - c. Ideal and actual gas turbine.

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-623
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Automatic Control System
[CGPA]

[Time: Three Hours]

[Max. Marks: 80]

- N.B
- Please check whether you have got the right question paper.
- Question number 1 from section A and Question number 6 from section B are compulsory.
 - From the remaining questions solve any two questions from each section.
 - Use of semi-log and graph paper allowed.
 - Figures to the right indicate full marks.
 - Assume suitable data, if necessary.

SECTION - A

- Q.1 Attempt any five of the following: 10
- Name the major parts of a closed loop control system.
 - What is the effect of positive feedback on stability?
 - Explain the important properties of "Transfer Function".
 - Write the analogous electrical elements in force-voltage analogy for the elements of mechanical translational system.
 - Give the various applications of DC motors in industrial control systems.
 - Write Mason's Gain Formula.
 - With the help of an example explain the meaning of proportional control action.
- Q.2
- Write in detail mathematical representation of mechanical and electrical system. 05
 - For the mechanical system shown in Figure 1. Construct grounded chair representation 10 and determine the differential equations relating f and x , f and y , and x and y .

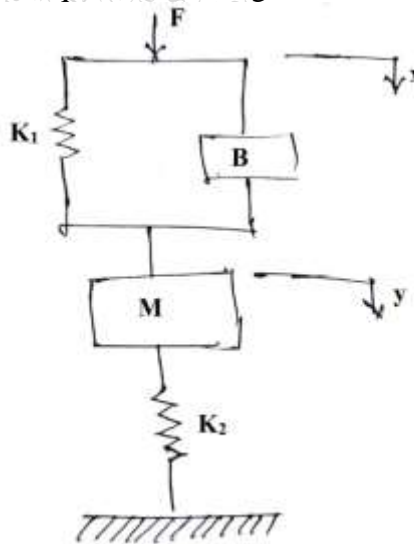


Figure (1) Mechanical System

Q.3

- a) Compare the pneumatic and hydraulic control system. 07
- b) Reduce the block diagram as shown in Figure 2 and obtain the closed loop transfer function $C(S)/R(S)$. 08

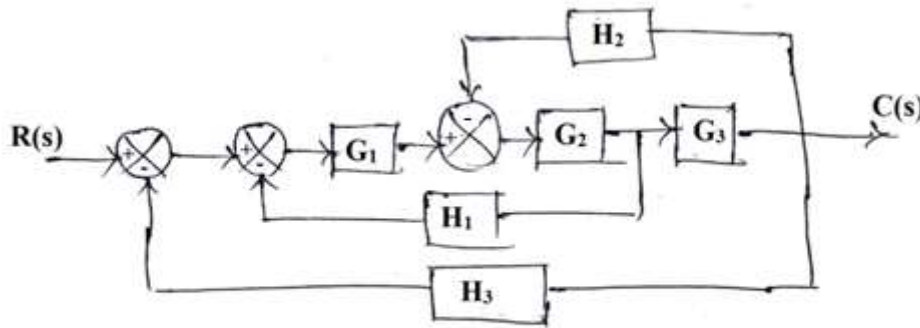


Figure (2)

Q.4

- a) Explain P+I+D controller. 07
- b) Find the transfer function of the system shown in Figure 3 using Mason's gain formula. 08

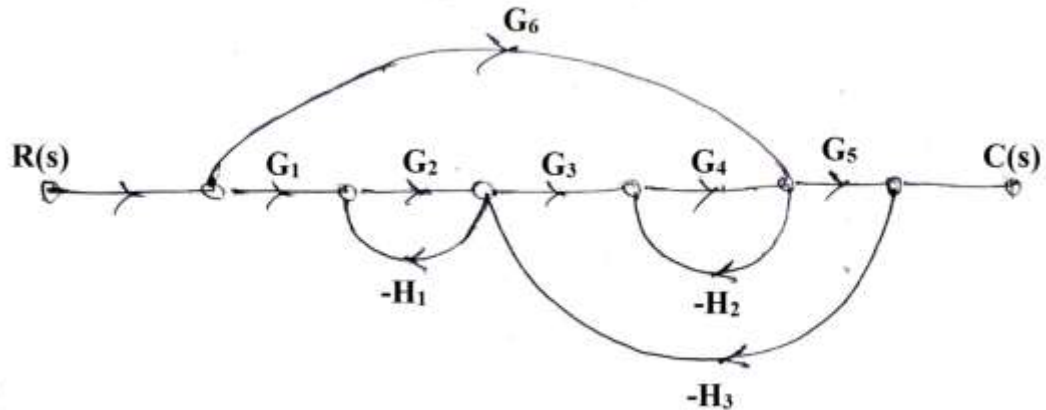


Figure (3)

Q.5

- a) What do you understand by 'ON/OFF' control action? Enlist applications of 'ON/OFF' control actions sketch any one system using ON/OFF control action. 08
- b) Explain A.C. servomotor with neat sketch. State its application. 07

SECTION – B

Q.6

Attempt any five of the following.

- a) What are the various standard test signals used for studying transient response? Which one is most widely used? 10
- b) Sketch the response of a second order under damped system.
- c) Define Routh stability criterion.
- d) What do you understand by decibel?
- e) State the steps to plot a bode plot.
- f) State Nyquist stability criteria?
- g) Write the expression for the angle of asymptotes.

Q.7

- a) Derive the equation for unit step input response of first – order system. 07

- b) For a control system shown in Figure 4. Find the value of K_1 and K_2 so that maximum overshoot is 25% and peak time is 4sec, when it is subjected to a step input. 08

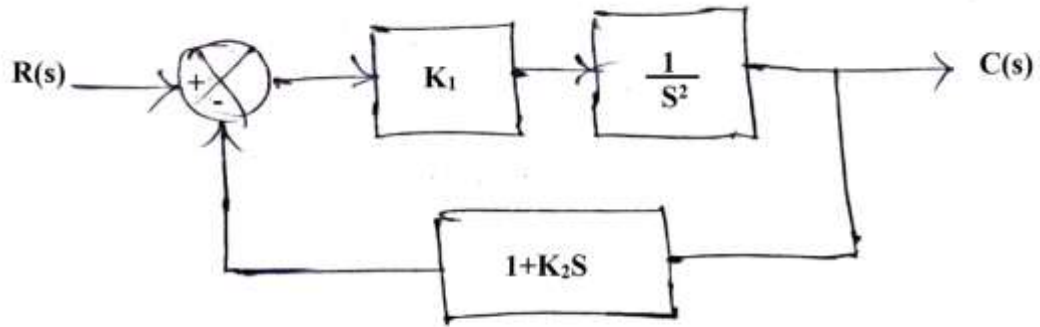


Figure (4)

- Q.8 a) Explain the necessary and sufficient conditions of Routh – Hurwitz criterion for determination of stability of linear control system. 05
 b) Determine the range of values of K so that the system having the following equation will be stable. 10
 $s(s^2 + 2s + 3)(s + 2) + k = 0$

- Q.9 a) Discuss the advantages and limitations of Bode Plot method of analysis of the control systems. 05
 b) For the unity feedback control system. 10

$$G(s) = \frac{5}{s(s + 1)(s + 5)}$$
 Sketch the Bode plot and determine the gain margin, phase margin, gain cross over frequency, phase cross over frequency and comment on the stability.

- Q.10 a) Explain the role of MATLAB software in control engineering. 05
 b) Sketch the root locus for OLTF 10

$$G(s) = \frac{K}{s(s + 2)(s + 9)}$$

Total No. of Printed Pages: 02

SUBJECT CODE NO:- H-631
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Metrology & Quality Control
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
1. Attempt any three questions from each section.
 2. Assume suitable data if necessary.
 3. Figures to the right indicate full marks.

Section A

- | | | |
|-----|--|----|
| Q.1 | a) What are the different sources of error? | 07 |
| | b) Explain the working of sine bar with a neat sketch. | 06 |
| Q.2 | a) Explain Reed type mechanical comparator. | 07 |
| | b) Explain the phenomenon of light wave interference. | 06 |
| Q.3 | a) Explain the construction and working of Taylor Hobson Taly surf. | 07 |
| | b) What are the different types of fits? Give an example of each. | 06 |
| Q.4 | a) Explain construction and working of profile projector. | 07 |
| | b) Explain construction and working of co. ordinate measuring machine (CMM). | 06 |
| Q.5 | Write short notes on (any two) | 14 |
| | a) NPL Interferometer | |
| | b) Angle Dekkor | |
| | c) LASER in Metrology | |

Section B

- | | | |
|-----|--|----|
| Q.6 | a) Explain the concept of quality circle. | 07 |
| | b) What is cause & effect Diagram? Explain with an example. | 06 |
| Q.7 | a) What is scatter diagram? Explain its three types. | 07 |
| | b) What is fault Tree analysis (FTA)? Explain with an example. | 06 |
| Q.8 | a) What is “Kaizen”? Explain with an example. | 07 |
| | b) What is “Kanban”? Explain with an example. | 06 |
| Q.9 | a) What is process capability? Explain with an example. | 07 |
| | b) What is Acceptance sampling? State its advantage and disadvantages. | 06 |

Q.10 Write short notes on (any two)

- a) OC Curve
- b) JIT
- c) FMECA

Total No. of Printed Pages: 02

SUBJECT CODE NO:- H-638
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Energy Conservation and Management
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
1. Question no 1 & 6 are compulsory.
 2. From remaining questions solve any two from each section.
 3. Figures to right indicates marks.
 4. Draw a neat sketch wherever required.
 5. Assume suitable data wherever required.

Section A

- | | | |
|-----|---|---------------------|
| Q.1 | Solve the following | 10 |
| | <ol style="list-style-type: none"> a) What is primary and secondary energy source? b) What are different applications of compressed air system? c) State the significance of co-generation d) What is Kyoto protocol about? e) What are different types of biofuels? | |
| Q.2 | <ol style="list-style-type: none"> a) What is energy conservations act? Explain b) What is the concept of clean development mechanism (CDM)? Explain? | <p>08</p> <p>07</p> |
| Q.3 | <ol style="list-style-type: none"> a) To make boiler work energy efficient, how energy conservation in boiler is considered? b) What is biofuels? What are recent international advance in biodiesel? Explain. | <p>08</p> <p>07</p> |
| Q.4 | <ol style="list-style-type: none"> a) With practical example explain the cogeneration in sugar industry. b) What energy pricing is? Explain | <p>10</p> <p>05</p> |
| Q.5 | Write short note any two:- <ol style="list-style-type: none"> a) Road map of JNNSM b) Energy conservation in pumps and fans c) Photovoltaic system. | 15 |

Section B

- | | | |
|-----|---|---------------------|
| Q.6 | Solve the following | 10 |
| | <ol style="list-style-type: none"> a) What is the strategy for daylight control? b) What are merits of E-vehicles? c) What are different types of energy audits? d) How biomass is of used with reject to energy? e) With example list different renewable and non-renewable energy sources. | |
| Q.7 | <ol style="list-style-type: none"> a) What are different E-vertical power storage options? Explain. b) What is the present status in the development of E-verticals? | <p>08</p> <p>07</p> |

- Q.8 a) With a case study of sugars industry explain how energy audit is done? 08
b) For economical functioning of any system it is essential to have energy audit justify the statement. 07
- Q.9 a) In what way there can be investment on energy efficient appliances? Explain? 08
b) What is energy flow sankey diagrams explain? 07
- Q.10 Write short note on any two:- 15
 - a) Charging station for E-vehicle
 - b) Energy efficient illumination
 - c) Energy scenario.

Total No. of Printed Pages: 1

SUBJECT CODE NO:- H-648
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I Power Plant Engineering
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q. No.5 and 10 are compulsory.
 - ii) Solve any two questions from Section-A (Q. 1, 2, 3, 4) and Section B (Q. 6, 7, 8, 9)

Section A

- Q.1
- a) Explain the effect of variable load on power plant? 07
 - b) Explain the load duration curve with example? 07
- Q.2
- a) What are the site selection criteria's for thermal power plant? 07
 - b) Explain in detail working of thermal power plant? 07
- Q.3
- a) Explain the ash handling and dust collection units of coal thermal power plant? 07
 - b) Explain types of boiler draught system? 07
- Q.4
- a) Enlist merits and de-merits of Diesel power plant over thermal power plant? 07
 - b) Explain present trends in diesel research? 07
- Q.5
- Write short notes on any three 12
- 1) Cooling tower
 - 2) Supercharging of diesel engine
 - 3) Capacity and diversity factors
 - 4) Layout of thermal power plant

Section B

- Q.6
- a) What are environmental aspects of power generation? 07
 - b) Explain cost of energy production? 07
- Q.7
- a) What are site selection criteria's for hydroelectric power plant? 07
 - b) Explain different types of dam? 07
- Q.8
- a) Explain different components of hydro station reservoirs? 07
 - b) Explain surge tank and water hammering effects? 07
- Q.9
- a) Explain with neat sketch pressurized water reactor (PWR)? 07
 - b) Explain function of control rods, moderators and fuel rods in the nuclear power plant? 07
- Q.10
- Write short notes on any three. 12
- 1) CANDU reactor
 - 2) Hydrographs
 - 3) Tariffs for electrical energy
 - 4) Safety rules in nuclear power plant.

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-649
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Elective-I Production Planning and Control
[CGPA]

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Solve any three questions from each Section.
 - 2) Figures to the right indicate full marks.
 - 3) Assume suitable data if required & state it clearly.

Section A

- Q.1 a) Describe production procedure or production cycle. 08
 b) Explain centralized and decentralized PPC. 05
- Q.2 a) Define continuous production system. Differentiate between mass production & flow production. 05
 b) What are different methods of forecasting? Discuss merits & demerits of various methods. 08
- Q.3 a) Following data refers to past sales of one product: 10

Year:	1982	1983	1984	1985	1986	1987	1988	1989	1990
Sales in Rs. (crore):	39	54	62	73	85	100	95	105	120

Use least square method & estimate sales forecasting of year 1992.

- b) Explain the need for forecasting. 03
- Q.4 a) What are seasonal variations? Why they are important in forecasting? 04
 b) Explain Q system (fixed order quantity) and P system (Periodic review system). 09
- Q.5 a) Describe the procedure for ABC analysis. Bring out the merits & demerits of ABC analysis. 07
 b) Derive an equation for EOQ with instantaneous stock replenishment. (Basic inventory model). 07
- Section B**
- Q.6 a) Define routing. Explain routing procedure in brief. 06
 b) Describe 'Route sheet' with suitable example. 07
- Q.7 a) Define the concept and strategies for aggregate planning. 06
 b) What is dispatching? State the various activities of dispatching in brief. 07
- Q.8 a) Describe the follow up or control phase of PPC. 07
 b) Discuss the concept of computer in production planning and control. 06

- Q.9 a) State and describe the steps involved in recruitment and selection of employees. 07
- b) Define recruitment. Describe the various sources of recruitment in brief. 06
- Q.10 a) Discuss the factors and restrictions to be considered while selecting materials. 07
- b) What are the factors to be considered while selecting a material? Explain. 07

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-650
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I Advanced Materials and Manufacturing
[CGPA]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Q.No.1 and 6 are compulsory.
- 2) Attempt any two questions from remaining four questions.
- 3) Figures to the right indicate full marks.

Section A

- | | | |
|-----|--|----------|
| Q.1 | Attempt following questions | 10 |
| | <ol style="list-style-type: none"> a) State application of Composite b) Enlist various types of polymers c) State the properties of smart materials d) Give classification of ceramics e) Give application of plastics and Elastomers | |
| Q.2 | <ol style="list-style-type: none"> a) With neat sketch explain particulates reinforced composite. b) Explain thermoplastics in detail. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a) Explain in detail significance and application of semi conductivity materials. b) Explain magneto materials with application. | 07
08 |
| Q.4 | <ol style="list-style-type: none"> a) Explain critical volume fraction in composites. b) Give the mechanical characteristics of elastomers in detail. | 07
08 |
| Q.5 | Write short notes on | 15 |
| | <ol style="list-style-type: none"> a) Ceramic matrix materials and application b) Thermoplastics c) Shape memory alloys | |

Section B

- | | | |
|-----|---|----------|
| Q.6 | Attempt following questions | 10 |
| | <ol style="list-style-type: none"> a) State application of flask less molding b) State principle of thermal spray coating c) State limitation of electro chemical machining d) Suggest a suitable method for making rail rools e) State specific application of Abrasive flow machining. | |
| Q.7 | <ol style="list-style-type: none"> a) With neat sketch explain evaporative casting. b) Compare between chemical vapor deposition and physical vapor deposition. | 07
08 |

- Q.8 a) Suggest a suitable method for Micro drilling and explain in detail. 07
b) Explain in detail electro less coating. 08
- Q.9 a) Explain Non-traditional Deburring process with specific example. 07
b) Discuss in detail advantages and application of electro stream drilling. 08
- Q.10 Write short notes on 15
 - a) Sheet molding casting v-process
 - b) Electroplating
 - c) Water jet machining

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-651
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (MECHANICAL) (Sem-I)
Elective-I Advanced CAD/CAM
[CGPA]

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Solve any three questions from each section.
 - 2) Draw sketches to support your answers
 - 3) Abbreviations carry their usual meanings related to CAD/CAM.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Attempt any five of the following | 10 |
| | <ol style="list-style-type: none"> a) Define CAD b) Enlist common techniques of geometric modeling c) Define synthetic curve d) Draw surface of revolution e) What is NURBS f) Define surface g) What is Hermite cubic curve | |
| Q.2 | <ol style="list-style-type: none"> a) Discuss the functional areas of CAD. b) Illustrate the requirements of graphics software. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a) Explain curve manipulation in detail for Bezier curves. b) Present parametric representation of any two analytical curves | 07
08 |
| Q.4 | <ol style="list-style-type: none"> a) Illustrate blending of surfaces. b) Explain Hermite cubic surfaces | 07
08 |
| Q.5 | <ol style="list-style-type: none"> a) Present parametric representation of surfaces of revolution b) Classify wireframe entities in detail and draw the sketches | 07
08 |

Section B

- | | | |
|-----|---|----|
| Q.6 | Attempt any five of the following | 10 |
| | <ol style="list-style-type: none"> a) Define CAPP b) What are features of GKS c) Define Artificial Intelligence d) What is principle of CMM e) Define Tolerance f) List advantages of DNC | |

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-1151
FACULTY OF SCIENCE AND TECHNOLOGY
T.Y. B.Tech.(Mech/Prod) (Sem-VI)
Computational Techniques
[Old]

[Time: Two Hours]

[Max.Marks:40]

- N.B Please check whether you have got the right question paper.
- i) Use of non-programmable calculator is allowed.
 - ii) Q.No.1 and Q.No.5 are compulsory.
 - iii) Figures to the right indicate full marks.
 - iv) Attempt any two questions from the remaining questions from each section.

Section A

- Q.1 Answer the following multiple choice questions: 06
- a) While using False-Position Method, which of the following is second iteration for fourth root of 32?
 - i. 2.2462
 - ii. 2.335
 - iii. 2.3645
 - iv. 2.3770
 - b) ----- lies in the category of iterative method:
 - i. Bisection method
 - ii. Regula Falsi Method
 - iii. Sacent Method
 - iv. All of above
 - c) Back substitution procedure is used in:
 - i. Gaussian Elimination method
 - ii. Jacobi's method
 - iii. Gauss-Seidal method
 - iv. None of above
- Q.2 Enlist and explain types of errors. 07
- Q.3 Find a real root of the equation $F(X) = X^3 - X - 1 = 0$. use False Position Method. 07
- Q.4 Use Bisection method to determine the drag coefficient c needed for a parachutist of mass $m=68.1$ kg to have velocity of 40m/s after free falling for time 10s. Consider acceleration due to gravity is 9.81m/s^2 . Also consider: 07

$$v = \frac{gm}{c} [1 - e^{-(c/m)t}]$$

Section B

Q.5 Answer the following multiple choice questions: 06

- a) To apply Simpson's 1/3 rule, the number of intervals in the following must be:
 - i. 10
 - ii. 11
 - iii. 12
 - iv. 13
- b) Process of estimating the value of dependent variable at an intermediate value is called:
 - i. Interpolation
 - ii. Extrapolation
 - iii. Estimation
 - iv. Intrapolation
- c) Differences methods find the ----- solution of the system.
 - i. Numerical
 - ii. Analytical
 - iii. Particle
 - iv. Exact

Q.6 Find $F(33)$ from the Gauss forward formula: 07

X:	20	25	30	35	40	45
F(X):	354	332	291	260	231	204

Q.7 Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 1/8th rule. 07

Q.8 Find the least squares fit of the form $y = a_0 + a_1x^2$ to the following data: 07

X:	-1	0	1	2
Y:	2	5	3	0

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-1186
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech.(Mech) (Sem-VII)
Refrigeration & Air Conditioning
[Old]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Q.No.1 from section A & Q. No.6 from section B are compulsory.
- 2) Solve any two questions from remaining questions from each section.
- 3) Figure to right indicate full marks.
- 4) Use of non-programmable calculator & refrigerant tables is permitted.

Section A

- Q.1 Solve the following questions (any five): 10
- a) Write difference between Refrigerator & heat pump.
 - b) What do you mean by one tonne of refrigeration?
 - c) What do you mean by ODP and GWP?
 - d) What are different types of air refrigeration system?
 - e) What is the need of air-conditioning of air-crafts at high altitudes where ambient temperatures are very low?
 - f) What is compound refrigeration system employed when the condenser temperature to evaporator temperature range is very large?
- Q.2 A simple evaporative air cooling system is used for an aero plane to take 20 tonnes of load of refrigeration. The ambient air conditions are 20°C and 0.9 bar. The ambient air is rammed isentropic ally to a pressure of 1bar. The air leaving the main compressor at pressure 3.5 bar is first cooled in the heat exchanger having effectiveness of 0.6 and then in the evaporator where its temperature is reduced by 5°C. The air from the evaporator is passed through the cooling turbine and then it is supplied to the cabin which is to be maintained at a temperature of 25°C and at a pressure of 1.05 bar. If the internal efficiency of the compressor is 80% and that of cooling turbine is 75%, determine 15
1. Mass of air bled off the main compressor.
 2. Power required for refrigeration system.
 3. COP of the refrigeration system.
- Q.3 a) Describe the mechanism of a simple vapour compression refrigeration system. 05
- b) A commercial refrigerator operates with R-12 between 1.2 bar and 13.5 bar. The vapour is dry and saturated at the compressor inlet and saturated liquid after condensation. Assuming isentropic compression determine COP of the plant. Calculate the Power required to run the compressor to obtain a refrigerating capacity of 1TR. 10
- Q.4 Calculate the power needed to compress 20 Kg/min of R-12 from saturation vapor at 1.4 bar to a condensing pressure of 10 bar by two stage compression with inter-cooling by liquid refrigerant at 4 bar. Assume saturated liquid to leave the condenser & dry saturated vapor to leave the evaporator. 15

- Q.5 a) Write desirable properties of an ideal refrigerant in details. 05
 b) Explain working of Regenerative type of air-refrigeration system. 05
 c) Explain superheating and sub cooling of refrigerant in a vapor compression system with the help of P-H and T-S diagrams. 05

Section B

- Q.6 Answer any five of the following: 10
 a) Write a note on factors affecting comfort air conditioning.
 b) Define DBT and DPT.
 c) Write a short note on bypass factor for cooling coils.
 d) What is the use of analyzer in the vapour absorption system?
 e) Enlist different liquefaction system.
 f) What do you understand by Cryogenics?
- Q.7 a) Explain working of Electrolux Refrigeration system with the help of schematic diagram. 07
 b) Sketch & explain a cascade refrigeration system. Draw cascade refrigeration cycle on P-H & T-S diagram. 08
- Q.8 The readings from a sling psychrometer are as follows: 15
 Dry bulb temperature = 30°C, Wet bulb temperature = 20°C, Barometric reading = 740 mm of Hg.
 Using steam tables, find:
 1. Dew point temperature
 2. Relative humidity
 3. Specific humidity
 4. Degree of saturation
 5. Vapour Density
 6. Enthalpy of mixture per kg of dry air
- Q.9 A small office hall of 25 persons capacity is provided with summer air conditioning system with the following data: 15
 Outside conditions = 34°C DBT & 28°C WBT
 Inside conditions = 24°C DBT and 50% RH
 Volume of air supplied = 0.4 m³/min/person
 Sensible heat load in room = 125600 KJ/h
 Latent heat load in room = 42000 KJ/h
 Find sensible heat factor of the plant.
- Q.10 a) Explain Claude system for liquefaction of air. 05
 b) Explain Hampson-Linde System of Gas liquefaction. 05
 c) Comparison of Vapour Absorption & Vapour compression refrigeration system. 05

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-1220
FACULTY OF SCIENCE AND TECHNOLOGY
Final .Tech.(Mech/Prod) (Sem-VII)
Automatic Control System
[OLD]

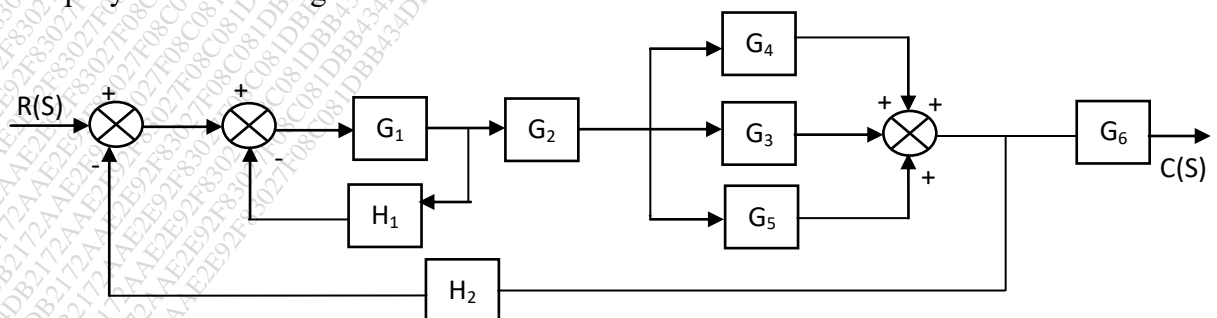
[Time: Three Hours]

[Max.Marks: 80]

- N.B Please check whether you have got the right question paper.
- 1) Q.No.1 from section A and Q.No.6 from section B are compulsory.
 - 2) Solve any two questions from remaining questions from each section.
 - 3) Assume suitable data, if required.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Answer any five of the followings: | 10 |
| | <ol style="list-style-type: none"> i) Define closed loop system. ii) Draw and explain Block Diagram of a closed loop system. iii) Define feedback path in a closed loop system. iv) Describe Zeros and poles of a transfer Function. v) Explain direct Analogy vi) Enlist various components in a control system. | |
| Q.2 | <ol style="list-style-type: none"> a) Derive a characteristic equation of a Electrical system [L-C-R] b) Derive a characteristic equation of Rotational Mechanical system. | 08
07 |
| Q.3 | <ol style="list-style-type: none"> a) Write a note on Gear Pump. b) Describe valves and their importance in Hydraulic system? Explain 2 way and 3 way directional control valves. | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) Explain Block Diagrams and its significance in control system? Describe the process of simplification of Blocks in: <ol style="list-style-type: none"> i) Parallel ii) Series b) Simplify the Block Diagrams and obtain its Transfer Function. | 08
07 |



- Q.5 Write short notes on: (any three) 15
- i) Optical Encoder
 - ii) Pneumatic Flapper Mechanism
 - iii) Linear Mechanical System
 - iv) Pressure Control Relays

Section B

- Q.6 Answer any five of the followings: 10
- i) Define ON-OFF Controller
 - ii) Describe Response and its types
 - iii) Explain Stability and its importance
 - iv) Define a Takeoff point in a Block Diagram
 - v) Define a Second Order System
 - vi) Describe peak time and rise time.

- Q.7
- a) Write a note on Stepper Motor. 08
 - b) Define various modes of control? Explain PID control action with figure. 07

- Q.8
- a) What are standard test signals? Explain various standard test input signals with Figures. 08
 - b) Explain the Proportional (P) controller in detail. 07

- Q.9
- a) Describe Routh's Stability Criteria. 05
 - b) Explain Bodes Plot in detail? And describe the following in detail. 05
 - i) Gain Margine
 - ii) Phase Margine
 - iii) Stability of the system

- c) Check the stability of the system whose characteristic equation is as follows 05
- $$S^4 + 2S^3 + 3S^2 + 4S + 5 = 0$$

- Q.10 Write short notes on: (any three) 15
1. Derivative Controller
 2. Hydraulic Actuation System
 3. Pneumatic Cylinders
 4. Frequency Response

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-1254
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech.(Mech) (Sem-VII)
Heat Transfer
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.:
- 1) Assume suitable data if necessary.
 - 2) Question 1 and Question 6 are compulsory.
 - 3) Solve any Two questions from remaining in each section.
 - 4) Use of non-programmable calculator and heat transfer data book is permitted.
 - 5) Draw sketches and give suitable mathematical expressions wherever necessary.

Section -A

- Q.1 Attempt **any four** questions of the following. 12
- a) What is meant by Transient heat conduction?
 - b) What are the functions of insulating material?
 - c) Explain the term 'Thermal contact resistance'.
 - d) State Newton's law of cooling.
 - e) Write the effects of various parameters on the thermal conductivity of solids.
- Q.2 Derive 3D general heat conduction equation in cylindrical coordinates. 14
- Q.3
- a) A 15 mm diameter steel sphere ($k=42 \text{ W/m-K}$) is exposed to cooling airflow at 20°C resulting in the convective coefficient $h = 120 \text{ W/m}^2 - \text{K}$. Determine Time required to cool the sphere from 550°C to 90°C . Take, density of mild steel is 7850 kg/m^3 , Specific heat is 475 kJ/kg-K , Thermal diffusivity is $0.045 \text{ m}^2/\text{hr}$. 08
 - b) A furnace is made of a red brick wall of thickness 0.5m and conductivity 0.7 W/m-K . For the same heat loss and temperature drop, this can be replaced by a layer of diatomite earth of conductivity 0.14 W/m-K then what will be the thickness of diatomite earth layer. 06
- Q.4
- a) A finned surface consists of root or base area of 1 m^2 and fin surface area of 2 m^2 . The average heat transfer coefficient for finned surface is $20 \text{ W/m}^2\text{K}$. Effectiveness of fins provided is 0.75 . If finned surface with root or base temperature of 50°C is transferring heat to a fluid at 30°C , then what is the rate of heat transfer through the fin? 08
 - b) Consider heat transfer between two identical hot solid bodies and the air surrounding them. The first solid is being cooled by a fan while the second one can cool naturally. For which solid is the lumped system analysis more likely to be applicable? Why? 06
- Q.5
- a) A tube having inside diameter of 2 cm is maintained at uniform temperature T_1 and is covered with an insulation ($k=0.20 \text{ W/m.K}$) to reduce heat loss. Heat is dissipated from the outer surface of insulation by natural convection with $h_0 = 15 \text{ W/m}^2.\text{K}$ into the 08

ambient air at T_a . Determine the critical thickness of insulation, calculate the heat loss ratio from the tube with and without insulation for i) the thickness of insulation equal to the critical thickness and ii) the thickness of insulation 2 cm thicker than the critical thickness.

- b) Write a short note on 'Dielectric Heating'.

06

Section- B

Q.6 Attempt **any four** questions of the following.

12

- Explain the mechanism of Radiation heat transfer.
- Define the term emissive power. What is the difference in values of emissivity's of black body and white body?
- Differentiate between parallel flow and counter flow heat exchangers.
- State Stefan-Boltzmann's law.
- What is 'Stanton Number'?

Q.7 a) Sketch formation of boundary layer and show laminar, transition & turbulent flow. 06

- b) Air at 200 kPa and 200°C is heated as it flows through a tube with a diameter of 25 mm at a velocity of 10 m./sec. The wall temperature is maintained constant and is 20°C above the air temperature all along the length of tube. Calculate: (i) The rate of heat transfer per unit length of the tube. ii) Increase in the bulk temperature of air over a 3 m length of the tube. 08

Q.8 a) Explain the Reciprocity rule, Summation rule and Superposition rule and Symmetry rule in context with view factor. 08

- b) How does radiosity for a surface differ from the emitted energy? For what kind of surfaces are these two quantities identical? 06

Q.9 a) A parallel flow heat exchanger has hot and cold-water stream running through it, the flow rates are 20 and 50 kg/min respectively. Inlet temperatures are 100°C and 50°C on hot and cold sides. The exit temperature on the hot side should not exceed 50°C. Assume $h_i = h_o = 600 \text{ W/m}^2\text{K}$. Calculate the area of heat exchanger using E-NTU approach. 08

- b) Sketch temperature distribution graph for condensers & evaporators. 06

Q.10 a) Differentiate Opaque body & perfectly transparent surface. 04

- b) Consider a cylindrical furnace with r (Radius of top and base) = H (Height) = 1m. The top (surface 1) and the base (surface 2) of the furnace has emissivity of 0.8 and 0.4, respectively, and are maintained at uniform temperatures $T_1 = 700 \text{ K}$ and $T_2 = 500 \text{ K}$. The side surface (surface 3) closely approximates a blackbody and is maintained at a temperature of $T_3 = 400 \text{ K}$. Determine the net rate of radiation heat transfer at each surface during steady operation and explain how these surfaces can be maintained at specified temperatures? 10

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-1289
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Tool Design
[Old]

[Time: Four Hours]**[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B

All questions are compulsory N.B.

1. Question No.1 from section A and Q.No.6 from section B are compulsory.
2. Attempt any three questions from the each section.
3. Figures to the right indicate full marks.

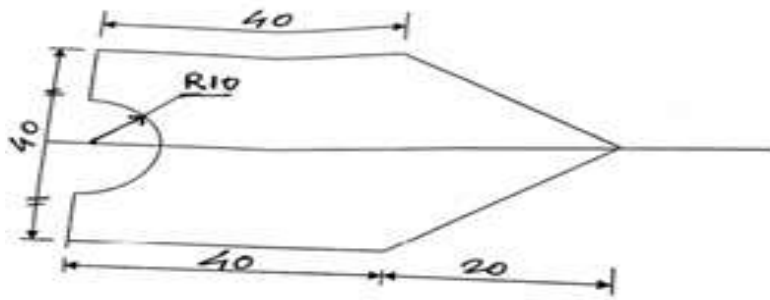
Section A

- Q.1 Attempt any five questions from the following. 10
- 1) What is meant by the term Tooling? List various types of tooling?
 - 2) Why are discontinuous types of chips preferred over the continuous types?
 - 3) Discuss the two methods of metal cutting?
 - 4) What are form tools?
 - 5) Define Fundamental deviation?
 - 6) State Taylor's principle of limit gauging?
- Q.2 a) In an orthogonal cutting operation, the following data have been observed: uncut chip thickness (t)= 0.127 mm, width of cut (b) = 6.35 mm, cutting speed (v) = 2 m/s, rake angle (α) = 10°, cutting force (F_c) = 567 N, thrust force (f_t) = 227 N, chip thickness (t_c) = 0.228 mm. determine 08
- 1) Shear angle
 - 2) Friction angle
 - 3) Shear stress along the shear plane
 - 4) Power for the cutting operation
 - 5) Shear strain in chip and shear rate
- b) A fit is designed as: 60 mm H7-h8, determine the minimum clearance and maximum clearance of the fit? The dia. Steps are 50mm & 80mm, IT8= 25i & IT 7 = 16 i? 07
- Q.3 a) How do you classify Broach, Sketch and discuss a typical internal broach nomenclature? 08
- b) A 25 mm H8-f7 fit is to be checked the limits of size for H8 hole are: High limit 25.033 mm 07
low limit 25.000 mm the limit of size for f7 shaft are High limit 24.980 mm low limit 24.959 mm taking gauge makers tolerance to be 10% of the works tolerance design plug gauges and gap gauges to check the fit?
- Q.4 a) Calculate the fundamental deviation, tolerances and hence the limits of sizes for the shaft and hole the following fit 70 mm H8-f7 the diameter steps are 50 mm and 80 mm 08
(Take IT8 = 25i, IT7 = 16i and fundamental deviation for shaft f is : ($-5.5D^{0.41}$))

- b) Explain in details Merchants force circle diagram and derive different relation? 07
- Q.5 a) Sketch, classify and discuss various types of gauges? 08
- b) A 300 mm diameter bar is turned at 45 rev/min, with depth of cut 2 mm & feed of 0.3 mm/rev the forces measured at the cutting tool point are; cutting force = 1850 N, feed force = 450 N; calculate 07
- i) Power consumption
 - ii) Specific cutting energy
 - iii) Energy consumed if the total metal removed during the Turing operation is $2.5 \times 10^6 \text{ mm}^3$

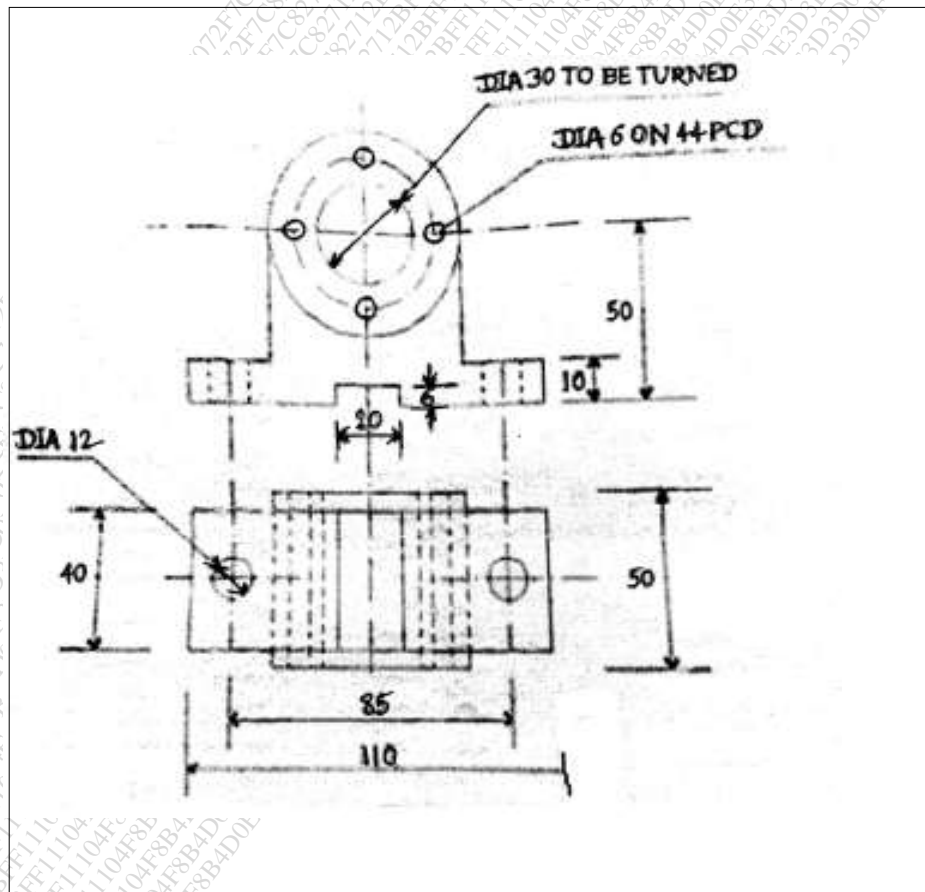
Section B

- Q.6 Attempt any five questions from the following. 10
- 1) What is fool proofing of jig and fixture? Give example?
 - 2) Describe the degree of freedom of a work piece located in space?
 - 3) What are the various ways in which dies can be classified?
 - 4) What is stock stop and pilot?
 - 5) What is the usual reduction for the first and succeeding draws?
 - 6) Differential between a blanking and a punching?
- Q.7 a) A washers with a 12.7 mm internal hole diameter and an outside diameter of 25.4 mm is to be made from 1.5 mm thick strip of 0.2 percent carbon steel consider the elastic recovery of the material. Find 08
- i) Clearance
 - ii) Blanking die-opening size
 - iii) Blanking punch size
 - iv) Piercing punch size
 - v) Piercing die opening size
- b) Differentiate between a Blanking die and Piercing die? 07
- Q.8 a) Define spring back and explain hoe allowances may be made to compensate for its harmful effects? 08
- b) What is mean by clearance? Why it is important in shearing operation? 07
- Q.9 Design and draw a compound or progressive die for the blank as shown in Figure ‘II’? 15



All Dimension are in mm
Figure II

Q.10 Design, Draw and dimension a Turning fixture to turn Bore 30 diameter, in the work piece as shown in Figure 'I'. Assume Turning is the last operation? 15



All Dimension are in mm
Figure I

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-1325
FACULTY OF SCIENCE AND TECHNOLOGY
Final .Tech.(Mech/Prod) (Sem-VII)
Ele-II-Project Management & Operation Research
[OLD]

[Time: Three Hours]**[Max. Marks: 80]**

N.B Please check whether you have got the right question paper.

- 1) Assume suitable data, if necessary.
- 2) Q.No.1 and Q.No.6 are compulsory.
- 3) Solve any two questions from remaining in each section.
- 4) Use of non-programmable calculator is allowed.

Section A

Q.1 Attempt any five:

10

- a) List the application of operation research in functional area of financial management.
- b) What are the methods used to arrive at an initial basic feasible solution to transportation model?
- c) State characteristics of LPP.
- d) Explain the steps involved in Simplex method.
- e) Write a note on Sensitivity analysis.
- f) Enlist any two model used in OR.

Q.2 A manufacturing company produces two products P1 and P2. Each product undergoes two operations 15 on machine M1 and M2. The time required to perform their operations with the available capacity of machine M1 and M2 in a given quarter are as given below: the market survey has predicted that not more than 450 units of product A and not more than 250 of product B can be sold in the given quarter. The company wants to determine the product mix to maximize profit. The unit profit for products A and B are Rs 20 and Rs 40 respectively.

Formulate the problem and solve graphically.

Machine	Product Time Reqd. per unit		Available Capacity (Hrs.)
	A	B	
M1	1.5 Hrs	1 Hr	750
M2	1 Hr.	3 Hrs.	900
Profit	Rs.20	Rs.40	

Q.3 a) Find the optimum solution to the following transportation problem in which the cell contains the transportation cost in rupees. Find IBFS using lowest cost entry method. 12

	W1	W2	W3	W4	W5	Available
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	15	20	5	

b) Also find out IBFS with North West corner method.

03

Q.4 Five lectures by experts are to be scheduled so as not to conflict with one another. The lectures are to be delivered in the afternoon on week days only, otherwise, because of other close schedules; certain students will be forced to drop out lectures. The following table or matrix indicates the number of absentees lecture wise and day wise schedule these lectures in such a way as to minimize the total number of students forced to remain absent.

Lecture					
Day	1	2	3	4	5
Mon.	3	2	3	9	10
Tues.	11	5	9	10	2
Wed.	1	3	8	2	4
Thurs.	8	11	10	5	2
Fri.	8	6	5	6	9

Q.5 a) A dealer wishes to purchase a number of fans & sewing machines. He has only Rs.5760 to invest & has space for 20 items only. A fan cost Rs.360 & a sewing machine cost Rs.240. he can sell a fan at a profit of Rs.22 and a sewing machine at a profit of Rs.18. assuming that he can sell all items that he buys, formulate the problem as a LPP and solve graphically

08

b) Solve the following assignment model

07

	A	B	C	D
1	18	26	17	11
2	13	28	14	26
3	38	19	18	15
4	19	26	24	10

Section B

Q.6 Solve any five of the following

- What is minimax and maximin value in game?
- State any two network analysis methods.
- What is mean by critical path?
- Explain any four terms related to queuing theory problems?
- How to convert three machine n job sequencing problem into two machine n job?
- State any two assumptions in queuing model.

10

Q.7 Reduce following game by dominance rule. 15

	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

Q.8 There are seven jobs, each of which is to be processed through 03 machines: A, B and C in the order. Find the sequence of jobs, total elapsed time and idle time of each machine. 15

Machine	Task						
	1	2	3	4	5	6	7
M _A	12	6	5	3	5	7	6
M _B	7	8	9	8	7	8	3
M _C	3	4	11	5	2	8	4

Q.9 a) The arrival rate of a customer at a service window of a cinema hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with a mean of 60 per hour. Find 10

1. Average number of customer in the system (Ls)
2. The average queue length (Lq)
3. The average waiting time in the system. (Ws)
4. The average waiting time in the queue (Wq)

b) Explain Kendal's notations in queuing problem. 05

Q.10 A project consists of the following activities. Find the optimum project time & corresponding minimum total project cost by crashing appropriate activities indirect cost per day is Rs.400. draw project network. 15

Activity	Time (Weeks)		Cost (Rs.)	
	Normal	Crash	Normal	Crash
1-2	9	4	1300	2400
1-3	15	13	1000	1380
2-3	7	4	7000	7540
2-4	7	3	1200	1920
2-5	12	6	1700	2240
3-6	12	11	600	700
4-5	6	2	1000	1600
5-6	9	6	900	1200

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-4002
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Tool Design
[Revised]

[Time: Three Hours]**[Max.Marks: 80]**

Please check whether you have got the right question paper.

- N.B
- 1) Q.1 and Q.6 are compulsory. Solve any two questions from remaining from each Section.
 - 2) Draw neat sketches wherever necessary.
 - 3) Use of non-programmable calculator is allowed.

Section A

- Q.1 Attempt any five: 10
- 1) What is tool signature?
 - 2) What are applications of D steels ?
 - 3) State any two desirable properties of cutting fluid.
 - 4) State any two applications of clearance fit.
 - 5) Define tool life in any two ways.
 - 6) State any two elements of single point cutting tool.
- Q.2 08
- a) Derive the relation between shear angle and chip thickness ratio.
 - b) Derive the relation between three velocities in metal cutting. 07
- Q.3 08
- a) In an orthogonal cutting operation, the following data have been observed.

Uncut chip thickness	$t=0.127$ mm
Width of cut	$b=6.35$ mm
Cutting speed	$v= 2$ m/s
Rake angle	$\alpha = 10^\circ$
Cutting force	$F_c=567$ N
Thrust force	$F_t=227$ N
Chip thickness	$t_c=0.228$ mm

 Determine: shear angle, the friction angle, shear stress along the shear plane and the power for the cutting operation. 08
 - b) Describe different types of cutting fluids. 07
- Q.4 Describe Merchant's force circle diagram for finding various forces in metal cutting. 15
- Q.5 Write short notes (Any three) 15
- i) Geometry of drill & nomenclature
 - ii) Different types of fits
 - iii) Types of gauges
 - iv) Taylor's principle of gauge design.

Section B

- Q.6 Attempt any five: 10
- i) Differentiate between 3-2-1 & 4-2-1 principle.
 - ii) State exact difference between jig & fixture.
 - iii) Which is compound die?
 - iv) Difference between Blanking & piercing.
 - v) State importance of centre of pressure in dies.
 - vi) Define drawing die.
- Q.7 Design, draw and dimension a drill jig to drill the two holes of dia. 10 mm in the component shown in figure –I. 15
Assume all other operations are done except the last two holes.
- Q.8 Design, draw and dimension a milling fixture of mill a slot 6mm wide in the component shown in figure-II. Assume slot milling the Last operation. 15
- Q.9
 - a) Describe various methods of reducing cutting forces in press tools. 08
 - b) What is knockout? Explain its function. 07
- Q.10 Write short note (any three) 15
- a) Stripper
 - b) Principles of clamping
 - c) Drawing die
 - d) Single & double acting drawing die

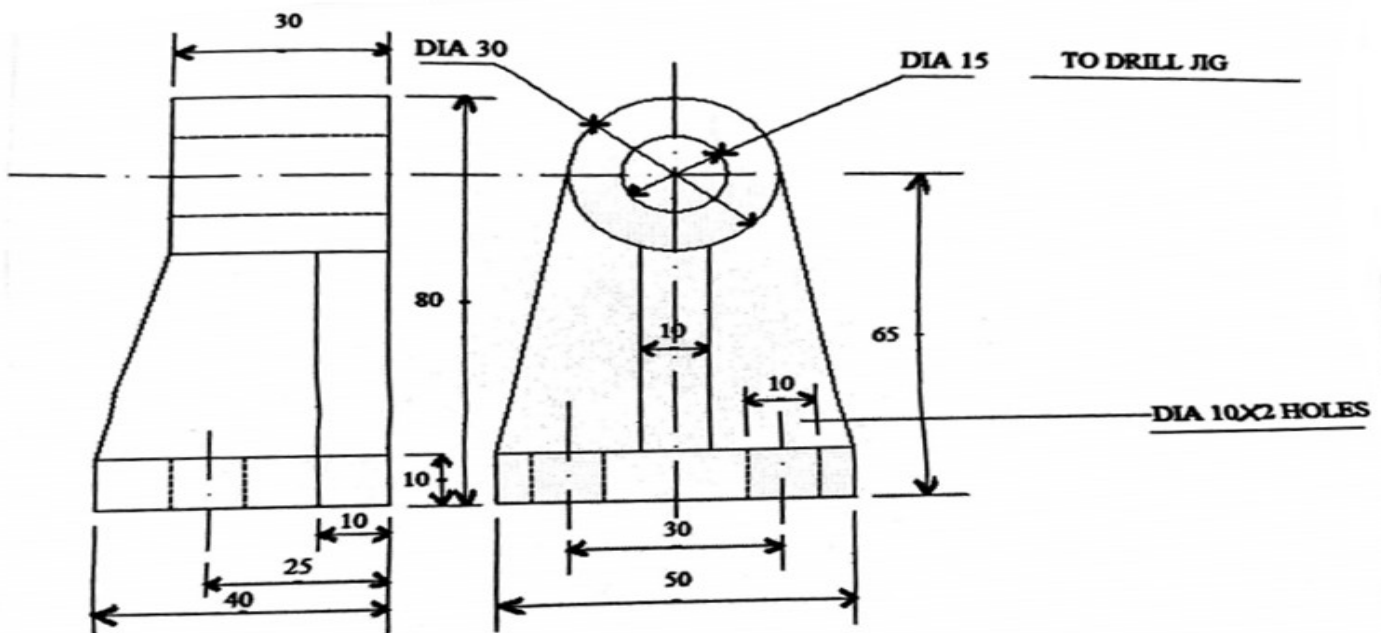
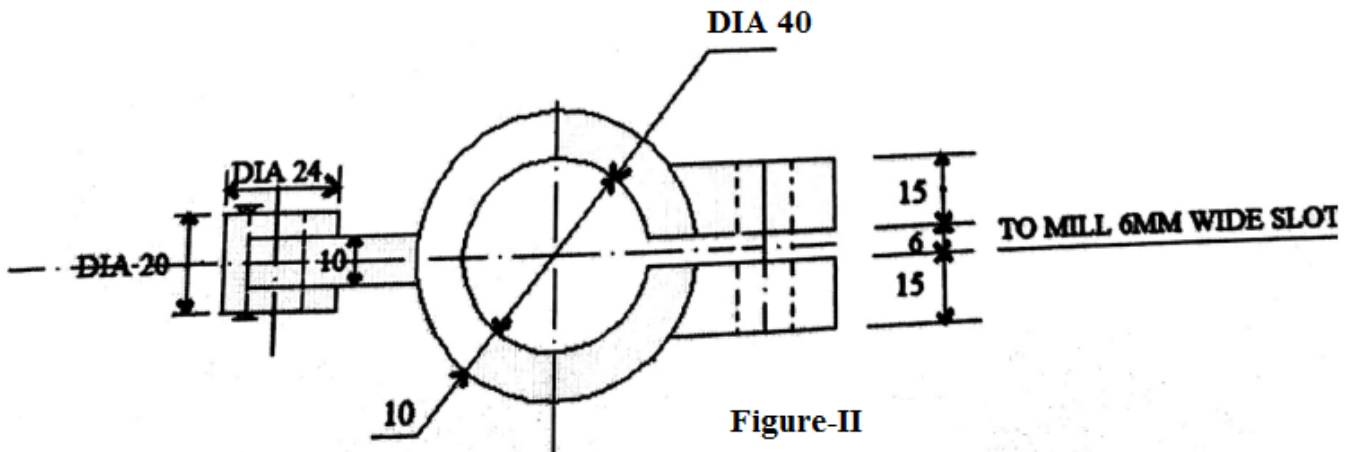
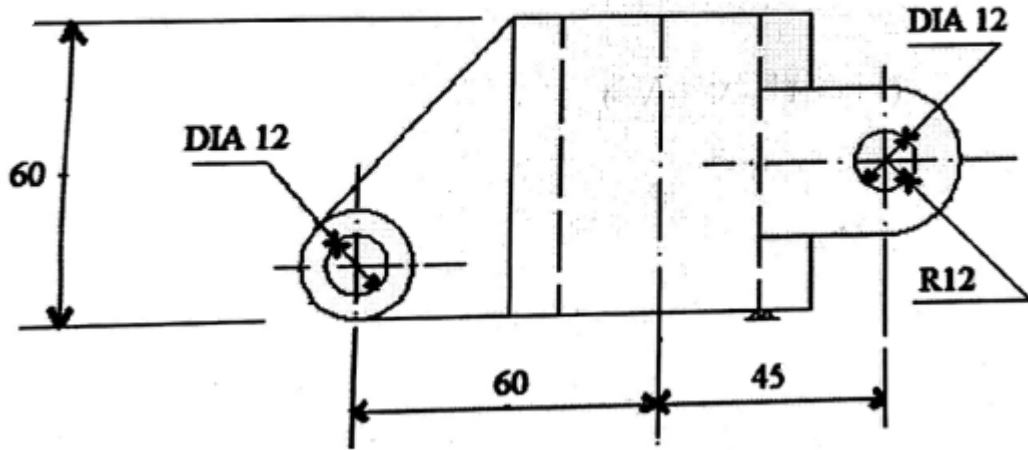


Figure.1



Total No. of Printed Pages:03

SUBJECT CODE NO:- H-4009
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech.) (Sem-VII)
Automatic Control System
[Revised]

[Time: Three Hours]

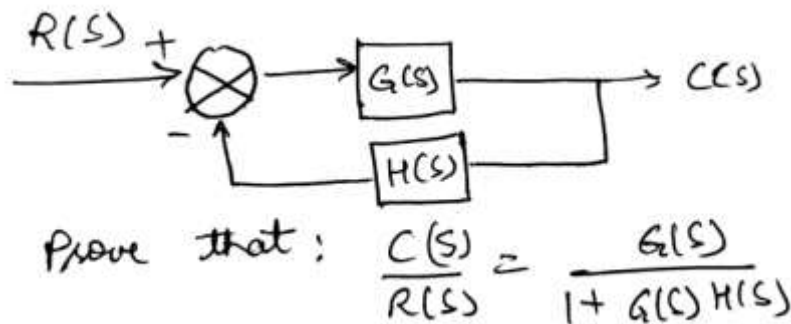
[Max.Marks: 80]

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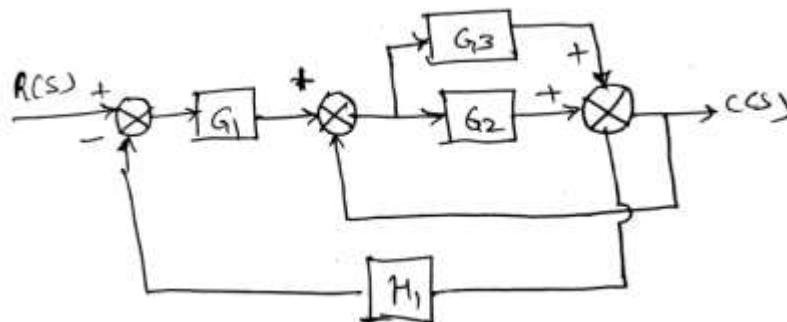
- N.B
- 1) Question no. 1 from Section A and Question no. 6 from Section B are compulsory.
 - 2) Solve any twoquestions from remaining questions from each Section.

Section A

- Q.1 Solve any five of the following: 10
- 1) Explain open loop and closed loop system.
 - 2) Enlist advantages of Block diagram.
 - 3) Describe transfer function.
 - 4) What are the different types of control action?
 - 5) Draw block diagram of a closed loop system.
 - 6) Define one pressure measuring device.
- Q.2 a) For the control system shown in figure below. 08



- b) Find the closed loop transfer function by reducing the block diagram shown below: 07



- Q.3 a) Describe construction and working of Vane Pump. 07
 b) Explain in detail the following: 08
 i) Direct analogy
 ii) Indirect analogy
- Q.4 a) Explain construction and working of 3 way and 4 way hydraulic valve. 07
 b) Write a note on LVDT. 08
- Q.5 Write short note on any three: 15
 1) Optical Encoder
 2) Blocks in cascade
 3) Stepper motor
 4) Thermocouple

Section B

- Q.6 Solve any five of the following: 10
 1) Give example of ON-OFF controller.
 2) Describe take off point in Block diagram.
 3) What are zeros and poles of transfer function?
 4) Define stability for a control system.
 5) Describe the proportional control action.
 6) Describe second order system.
- Q.7 a) Define response of a system? Explain transient and steady state response. 03
 b) Explain PID control action in detail with figure. 12
- Q.8 a) Define the following i) Step Input 03
 ii) Ramp input
 iii) Impulse input
 b) The open loop transfer function of a unity feedback control system is given by 12

$$G(S) = \frac{25}{S(S + 5)}$$
 Obtain maximum overshoot, peak time, rise time and settling time.

- Q.9 a) Determine the stability of a system whose characteristic equation is given by 03

$$S^4 + 2S^3 + 3S^2 + 4S + 5 = 0$$

 b) Draw the Bode plot for the transfer function 12

$$G(S) = \frac{16(1 + 0.5S)}{S^2(1 + 0.125S)(1 + 0.1S)}$$
 From the graph determine:
 i) Phase Crossover frequency
 ii) Gain Crossover frequency
 iii) P.M
 iv) G.M
 v) Stability of the system

Q.10 Write short note on any three:

- 1) Modes of control
- 2) Bellows
- 3) Frequency response
- 4) Derivative control action

Total No. of Printed Pages:5

SUBJECT CODE NO:- H-4016
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Refrigeration and Cryogenics
[Revised]

[Time: Three Hours]

[Max. Marks:80]

- N.B
- Please check whether you have got the right question paper.
- (i) Question number 1 and 6 are compulsory, answer remaining any two questions from each section.
 - (ii) Refrigeration properties tables and charts are allowed.
 - (iii) Figures to the right indicates full marks.
 - (iv) Assume suitable data, if necessary.

SECTION - A

Q.1 Choose correct answer of the following (any five) (10)

1. One tone of refrigeration implies that the machine has refrigerating effect (capacity of heat extraction from the system being cooled) equal to
 - (a) 210 kJ/s
 - (b) 210 kJ/min
 - (c) 210 kJ/hr
 - (d) 210 kJ/day
2. The capacity of the refrigerating machine is expressed as
 - (a) Inside volume of cabinet
 - (b) Lowest temperature attained
 - (c) Gross weight of machine in tons
 - (d) Rate of abstraction of heat from space being cooled
3. Carnot refrigerator extracts 500 kJ of heat per minute from cold room which is maintained at -10°C and it is discharged to atmosphere at 35°C . The power required to run the refrigerator is
 - i) 2.25 kW
 - ii) 1.425 kW
 - iii) 2.75 kW
 - iv) 1.5 kW
4. In vapour compression refrigeration system, liquid to suction heat exchanger is used to
 - (a) Keep the COP constant
 - (b) Prevent the liquid refrigerant from entering the compressor
 - (c) Subcool the liquid refrigerant leaving
 - (d) Subcool the vapour refrigerant from the evaporator

5. Which of the following component is common between vapour compression and vapour absorption systems?
 - (a) Absorber
 - (b) Generator
 - (c) Condenser
 - (d) Rectifier

6. Why is the flash chamber in the refrigeration circuit installed?
 - (a) To reduce the pressure losses through the evaporator
 - (b) To reduce the size of evaporator by avoiding vapour going to evaporator
 - (c) To improve overall heat transfer coefficient.
 - (d) All of the above

7. The refrigerant R-290 stands for
 - (a) C_2H_4
 - (b) C_2H_8
 - (c) C_2H_{10}
 - (d) C_2H_{12}

Q.2 For an R-12 simple vapour compression refrigeration system operating temperature limits of $-15^\circ C$ evaporator temperature and $40^\circ C$ condenser temperature. There is no under cooling and superheating of vapour. If the condenser temperature increased by $5^\circ C$ and evaporator temperature reduced to $-10^\circ C$. Determine following for both cases (15)

- (i) COP of the system
- (ii) Mass flow rate of refrigerant
- (iii) Theoretical piston displacement.

Assume the capacity of plant 10TR.

Q.3 A two-stage refrigeration system works between the temperature limits of $40^\circ C$ and $-15^\circ C$ as shown in figure 1. Obtain the COP and capacity for a flow rate of 0.2 kg/s through the evaporator. The intermediate pressure is 4.0 bar. Compare the COP and capacity of the two-stage system with corresponding to single-stage operating between the above temperature limit. The refrigerant used in R-12. (15)

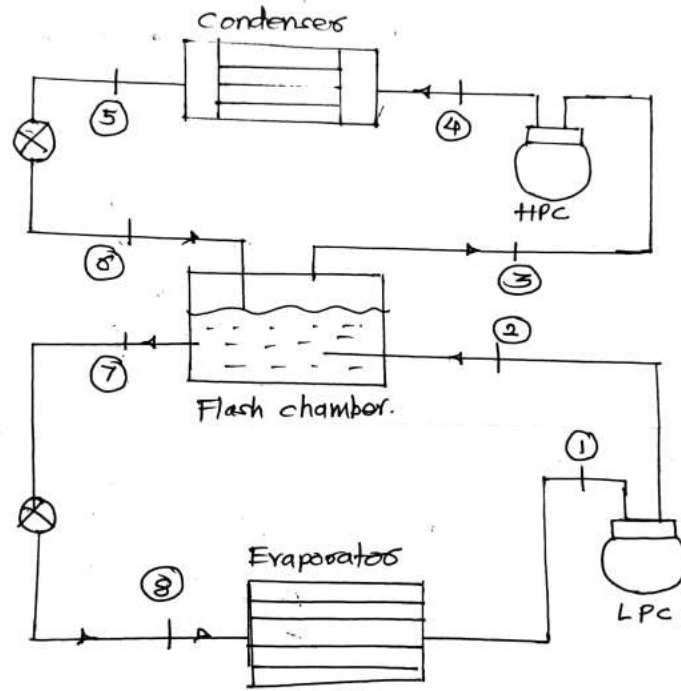


Figure 1.0

- Q.4 (a) Make the comparative list between a vapour absorption refrigeration system and vapour compression system. (07)
- (b) Define a 'refrigerant' and explain how are the refrigerants classified and designated? (08)
- Q.5 Write descriptive notes on (any three) (15)
1. Effect of superheating and subcooling on performance of refrigeration system
 2. Steam jet refrigeration system
 3. Magnetic refrigeration system
 4. ODP and GWP.

SECTION B

- Q.6 Choose correct answer of the followings (any five) (10)
1. Reversed Carnot cycle comprises
 - (a) Two-isentropic processes and two adiabatic processes.
 - (b) Two isentropic processes and two isothermal processes
 - (c) Two isentropic processes and two constant pressure processes
 - (d) Two isentropic processes and two constant volume processes
 2. A boot strap air cooling system has
 - (a) One heat exchanger
 - (b) Two heat exchanger
 - (c) Three heat exchanger
 - (d) Four heat exchanger

3. Dry ice is
 - (a) Solidified carbon dioxide
 - (b) Ice free from dissolved air and gases
 - (c) Ice free from impurities
 - (d) None of the above

4. Cascade refrigeration system is applicable to
 - (a) Air refrigeration
 - (b) Vapour compression refrigeration
 - (c) Vapour absorption refrigeration
 - (d) None of the above

5. Cryogenics deals with the temperature lower than-----
 - (a) -50°C
 - (b) -100°C
 - (c) -150°C
 - (d) All of the above

6. The location of freezer in the top portion of refrigerator results in
 - (a) Less noise in the system
 - (b) Quick cooling of entire system
 - (c) No overheating of the motor
 - (d) No adverse effect on the environment

7. Global warming is caused by
 - (a) Ozone
 - (b) Carbon dioxide
 - (c) Nitrogen
 - (d) Carbon monoxide

- Q.6. A cascade refrigeration system is designed to supply 9 tonnes of refrigeration at an evaporator temperature of -60°C and a condenser temperature of 25°C . The load at -60°C is absorbed by a unit using R-22 as the refrigerant and rejected to a cascade condenser at -20°C . The cascade condenser is cooled by a unit using R-12 as the refrigerant and operating between -30°C evaporating temperature and 25°C , but there is no subcooling of R-12 refrigerant. The gas leaving both the evaporators is dry and saturated and compression is isentropic. Neglecting losses determine: (15)
- (a) Compression ratio of each unit
 - (b) Quantity of refrigerant circulated per minute for each unit.
 - (c) COP of each unit

- (d) COP of whole unit
- (e) Theoretical power required to run the system.

Q.7 The following data refer to simple aircraft refrigeration system: (15)

Ram air temperature and pressure: 30°C and 1.05 bar

Cabin air temperature and pressure: 27°C and 1.0 bar

Pressure at the exit of main compressor: 4.5 bar

Effectiveness of heat exchanger: 0.8

Compressor efficiency: 0.84

Turbine efficiency: 0.78

Cooling load: 20 kW.

Determine:

- a) Capacity of plant in TR
- b) Mass of air bled from the main compressor for refrigeration.
- c) Heat rejected through the condenser.
- d) Power supplied to main compressor.
- e) COP of the system

Q.8 (a) What is mean by preservation of food? What are different methods of food preservation? (07)

Explain one method of food preservation in detail.

(b) Explain with neat sketch pre cooled Claude system used for liquefaction of hydrogen. (08)

Q.9 (a) What are the limitations of vapour compression refrigeration system to achieve low temperatures? (07)

(b) What is Joule-Thomson effect; Joule Thomson coefficient and inversion curve? (08)

Q.10 Write descriptive notes (any three) (15)

- (a) Domestic Refrigerator
- (b) Application of cryogenics in cryosurgery
- (c) Boot strap refrigeration system
- (d) Dry ice production

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-4023
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Open Elective-II
Operations Research
[Revised]

[Time: Three Hours]

[Max.Marks: 80]

N.B Please check whether you have got the right question paper.
 1)Q 1 from Section A &Q6 from Section B are compulsory.
 2) Solve any two questions from each section other than Q1 & Q6.
 3) Assume suitable data, if required.

Section A

Q.1 Attempt any five: 10
 1. What is the role of O.R in Engineering?
 2. What is Iterative procedure?
 3. What are the characteristics of linear programming problem?
 4. Define slack variables.
 5. What is the relation between assignment and transportation problem?
 6. What is an unbalanced transportation problem?
 7. Write a historical note in brief about Operation Research?

Q.2 a) An aero plane can carry a maximum of 250 passengers. A profit of Rs. 1500 is made on each executive class ticket & a profit of Rs. 900 is made on each economy class ticket. The airline reserves at least 30 seats for executive class. However at least 4 times as many passengers prefer to travel by economy class then by executive class. Formulate this problem as a LPP & solve graphically. 10
 b) Explain the phases of O.R. 05

Q.3 Solve the following LPP by simplex method. 15
 Maximize $Z = 4X_1 + 3X_2$
 Subject to constraints,
 $3X_1 + 6X_2 \leq 18$
 $6X_1 + 4X_2 \leq 24$
 $X_1, X_2 \geq 0$

Q.4 Table below shows unit transportation cost from various go-downs to market area with their capacity & requirements. Find IBFS using Vogel's approximation method & also find the optimum solution. 15

	M1	M2	M3	M4	Capacity
G1	15	20	22	24	100
G2	18	17	12	10	200
G3	11	9	5	13	250
Requirement	75	75	275	125	

Q.5 Five new machines are to be located in a machine shop; there are five possible locations in which the machine can be located. The cost of placing machine at various locations is given in the table below: 15

	Location 1	Location 2	Location 3	Location 4	Location 5
Machine 1	20	23	18	10	16
Machine 2	50	20	17	16	15
Machine 3	60	30	40	55	8
Machine 4	6	7	10	20	25
Machine 5	18	19	28	17	60

It is required to place the machine at suitable location so as to minimize the total cost.

- A) Formulate an L.P model to find an optimal assignment.
- B) Solve the following assignment problem for minimum optimal cost.

Section B

Q.6 Attempt any five: 10

- 1) Explain pure and mixed strategy.
- 2) What is meant by Queue Discipline?
- 3) Define idle time on a machine in a sequencing problem.
- 4) What is economical order quantity?
- 5) What is the difference between individual and group replacement?
- 6) What is meant by critical path?
- 7) Define event float in CPM.

Q.7 a) A firm is considering replacement of a machine, whose cost is Rs. 12,200/- and the Scrap Value is Rs.200/- The running (Maintenance and operating) cost in rupees are found from experience to be as follows. When should the machine be replaced? 08

Year	1	2	3	4	5	6	7	8
Running Cost (Rs)	200	500	800	1200	1800	2500	3200	4000

b) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at RS. 50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find (a) the economic lot size (b) No. of orders per year. 07

Q.8 a) Determine the optimum strategies and the value of the following games. 08

	B			
A	-3	4	2	9
	7	8	6	10
	6	2	4	-1

b) Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order A-B-C as shown in the below table. Also find the total elapsed time. 07

Machine	Job					
	1	2	3	4	5	6
A	8	3	7	2	5	1
B	3	4	5	2	1	6
C	8	7	6	9	10	9

- Q.9 a) The arrival rate of a customer at a service window of a cinema hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with a mean of 60 per hour. Find. 08
- 1) Average number of customer in the system (Ls)
 - 2) The average queue length (Lq)
 - 3) The average waiting time in the system (Ws)
 - 4) The average waiting time in the queue (Wq)
- b) Draw the network diagram, calculate the EST and LFT, total float and project duration and show critical path on network for following data. 07

Activity	Time in days	Pre-operation
A	5	None
B	6	A
C	5	B
D	4	A
E	3	D
F	4	C,E

- Q.10 For a project, normal time, crash time, normal cost and crash costs are given in the table. Contract the network by crashing it to optimum value and calculate the optimum project cost. Indirect cost is given as Rs. 100/- per day. 15

Activity	Time (days)		Cost (Rs)	
	Normal	Crash	Normal	Crash
1-2	3	2	300	400
2-3	6	4	480	520
2-4	7	5	2100	2500
2-5	8	6	400	600
3-4	4	3	320	360
4-5	5	4	500	520

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-114
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) REV (Sem-II)
Automobile Engineering

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Solve any three questions from each Section.
 - 2) Draw neat sketches wherever necessary.
 - 3) Assume suitable data, if required.
 - 4) Figure to right indicate full marks.
- Section A
- Q.1
- a) List the main components of an automobile and with a neat sketch show the layout of these components on a front engine, all four wheel drive vehicle. 07
 - b) Explain the four wheel drive arrangement with neat sketch. 06
- Q.2
- a) Draw a neat sketch and explain the construction and working of multiple plate clutes. Explain why these clutches are used in two wheelers? 07
 - b) With the help of suitable diagram, describe the construction and working of diaphragm clutch. 06
- Q.3
- a) Explain the antiroll bar suspension with neat diagram. 07
 - b) Describe the construction of a sliding mesh gear box. Show how the power flows in various speeds. 06
- Q.4
- a) With neat sketch explain the construction and working of a wishbone parallel link independent suspension. 07
 - b) What are the different types of rubber springs? Briefly explain each. 06
- Q.5
- Write short notes on(any two) 14
- a) Automatic transmission in the automobiles.
 - b) Over drive in the gear box.
 - c) Propeller shaft
 - d) Centrifugal clutch

Section B

- Q.6
- a) Explain the terms:- 07
 - i) Camber
 - ii) King pin inclination.
 - b) What is the function of steering gearbox? With neat sketch explain construction & working of any one steering gear box? 06

- Q.7 a) Enlist different types of steering gearboxes. Also explain recirculating type steering gearbox. 07
 b) With neat sketch explain the hydraulic power steering. What are its advantages and limitation? 06
- Q.8 a) Explain briefly the working of ‘airbrakes’. What are their advantages and disadvantages? 07
 b) With neat sketch in a sectional view. Explain the construction & working of a tandem master cylinder? What are the advantages of its use? 06
- Q.9 a) What is the meaning of servo braking system? How the vacuum from the engine inlet manifold is utilized to actuate the vehicle brakes? 07
 b) Enumerate the factors which affect battery life. 06
- Q.10 Write short notes on (any two) 14
 a) Leading and trailing drum brakes
 b) Brake shoes used in hydraulic drum brake system.
 c) ABS
 d) Under steer and over steer

Total No. of Printed Pages:4

SUBJECT CODE NO:- H-147
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Project Management and Operations Research
[Revised]

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

- N.B
1. Solve any three questions from each section.
 2. Figures to the right indicate full marks.
 3. Assume suitable data wherever necessary.
 4. Use of non-programmable calculator, probability chart is permitted.

Section A

- Q.1 a) Define “Operation Research” and explain briefly Phases of OR study. 05
- b) The standard weight of a special purpose brick is 5kg and it contains two basic ingredients B₁ and B₂. B₁ costs Rs.5/Kg and B₂ costs Rs.8/Kg. strength considerations dictate that the brick contains not more than 4Kg of B₁ and a minimum of 2Kg of B₂. Since the demand for the product is likely to be related to the prize of a brick, formulate and find graphically the minimum cost of the brick satisfying the above conditions.

- Q.2 Solve using Big-M Method, the following LPP 13
- Minimize $Z = 3x_1 + 8x_2$
 Subject to, $x_1 + x_2 = 200$
 $x_1 \leq 80$
 $x_2 \geq 60$
 $x_1, x_2 \geq 0$

- Q.3 Solve using two-phase simplex method, 13
- Minimize $Z = 5x_1 - 4x_2 + 3x_3$
 Subject to, $2x_1 + x_2 - 6x_3 = 20$,
 $6x_1 + 5x_2 + 10x_3 \leq 76$,
 $8x_1 - 3x_2 + 6x_3 \leq 50$,
 $x_1, x_2, x_3 \geq 0$

- Q.4 Find the optimum solution to the following transportation problem in which the cell contains the transportation cost in rupees. Find IBFS using lowest cost entry method. 13

	W1	W2	W3	W4	W5	Available
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	15	20	5	

- Q.5 a) At the end of a cycle of schedules, a transport firm has a surplus of one vehicle in each of the 07 cities 1,2,3,4, and 5 a deficit of one vehicle in each of the cities A, B, C, D, E and F. the cost (In Rs.) of transportation and handling between the cities with a surplus and the cities with a deficit are shown in following table.

City	A	B	C	D	E	F
From						
1	134	116	167	230	194	97
2	114	195	260	166	178	130
3	129	117	48	94	66	101
4	71	156	92	143	114	136
5	97	134	125	83	142	118

Find the assignment of surplus vehicles to deficit cities that will result in a minimum total cost. Which city will not receive a vehicle?

- b) The cost of equipment is 62000 & its scrap value is Rs.2000. The life of the equipment is 8 07 years. The maintenance costs for each year are as given below. After how many years should the equipment be replaced?

Years	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	1000	2000	3500	5000	8000	11000	16000	24000

Section B

- Q.6 a) A motor garage has only one mechanic who specialist in high-speed cars. Number of 07 customers with high speed car follows Poission distribution with mean arrival rate of 10/ hour. Customer can wait if there is queue and attended in first come first serve basis. Time taken to attend a customer in exponentially distributed with a mean of 5 minutes. Calculate.
- Utilization parameter,
 - Probability that system is idle,
 - Average time mechanic is free on 8 Hr. per day,
 - Expected number of customers in garage.

- b) Five jobs are performed first on machine M1 and then on machine M2. Time in hours taken 07 by each jobs on each machine is given below. Determine a sequence for five jobs that will minimize the elapsed time T.

Jobs	A	B	C	D	E
M1	5	1	9	3	10
M2	2	6	7	8	4

- Q.7 a) Solve a game with saddle point method. Calculate 06
- Maximin, Minimax Value
 - Value of Game
 - Optimal strategy for both the player

iv) Is the game fair and strictly determinable?

		Players B			
		B1	B2	B3	B4
Player A	A1	-5	3	1	10
	A2	5	5	4	6
	A3	4	-2	0	-5

b) Reduce the following game by dominance and find the game value.

		Players B					
		I	II	III	IV	V	VI
Player A	1	4	2	0	2	1	1
	2	4	3	1	3	2	2
	3	4	3	7	-5	1	2
	4	4	3	4	-1	2	2
	5	4	3	3	-2	2	2

Q.8 a) What are the reasons for carrying inventories? 05

b) Alpha industry estimates that it will sell 12000 units of its product for the fourth coming year. The ordering cost is Rs.100 per order and carrying cost per unit per year is 20% of the purchase price per unit. The purchase price per unit is Rs.50. find 08

- i) Economic Order Quantity,
- ii) Number of order per year,
- iii) Time taken between successive orders.

Q.9 A project consists of the following activities, find the optimum project time and corresponding minimum total project cost by crashing appropriate activities on proper order. Indirect cost per day is Rs.400. 13

Activity	Time (Days)		Cost (Rs.)	
	Normal	Crash	Normal	Crash
1-2	9	4	1300	2400
1-3	15	13	1000	1380
2-3	7	4	7000	7540
2-4	7	3	1200	1920
2-5	12	6	1700	2240
3-6	12	11	600	700
4-5	6	2	1000	1600
5-6	9	6	900	1200

Q.10 Table below shows activities and their durations of completion.

13

- i) Find the expected durations and variance of all the activities
- ii) Find the expected project duration
- iii) Find the probability of completing the project on before 20 days.

Activity	Predecessor Activity	Durations		
		to	tm	tp
A	-	1	2	3
B	-	2	2	8
C	A	6	7	8
D	B	1	2	3
E	A	1	4	7
F	C, D	1	5	9
G	C, D, E	1	2	3
H	F	1	2	9

Some sample values of P corresponding to standard normal variate Z are given below:

P	0.4357	0.4370	0.4302	0.4394	0.4406
Z	1.52	1.53	1.54	1.55	1.56

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-182
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Refrigeration and Air Conditioning
(Revised)

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
1. Solve any three questions from each section.
 2. Figure to the right indicate full marks.
 3. Use of refrigerant table, steam tables & psychometric chart is allowed.
 4. Assume suitable data wherever necessary.

Section A

- Q.1
- a) Why it is necessary to modify Carnot Cycle? Explain. 03
 - b) Define refrigeration & its unit; also explain the term Coefficient of performance. 03
 - c) 1.5 kW per tonne of refrigeration is required to maintain the temperature of -40°C in the refrigerator. If the refrigeration cycle works on Carnot cycle, determine: 07
 1. COP of cycle
 2. Temperature of sink
 3. Heat rejected to sink per tonne of refrigeration.
- Q.2 A vapour compression refrigeration machine with Freon-12 as a refrigerant has a capacity of 12TR 13
operating between -28°C & 26°C the refrigerant is sub cooled by 4°C before entering the expansion valve & vapour is superheated by 5°C before leaving the evaporator. The machine has clearance of 3% of stroke volume.
Determine
- 1) Theoretical power
 - 2) C.O.P
 - 3) Volumetric efficiency
- Specific heat of liquid refrigerant = 0.963 KJ/ Kg-k & Specific heat of super-heated Vapour = 0.615 KJ/ Kg-k.
- Q.3 A single compressor using R-12 as a refrigerant has three evaporator of capacity 30TR, 20TR, 13
10TR. The temperature in the three evaporator is to be maintained at -10° , 5° & 10° respectively. The refrigerant leaving the condenser is sub cooled to 30°C . The vapour leaving evaporators are dry & saturated. Assuming isentropic compression find, mass of refrigerant flowing through each evaporator, power required & C.O.P of system.
- Q.4 An air craft moving with speed of 1000 km/h uses simple gas refrigeration cycle for air conditioning. 13
The ambient pressure and temperature are 0.35 bar and -10°C respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and expander are 0.8 each. The cabin pressure and temperature are 1.06 bar and 25°C .

Determine temperature and pressures at all points of cycle. Also find the volume of flow rate through compressor inlet and expander outlet for 100 TR. Take $C_p = 1.005 \text{ kJ/kg} - k$; $R = 0.287 \text{ kJ/kg} - K$ and $C_p/C_v = 1.4$ for air.

- Q.5 Write short notes on (any three) 14
- i) Cascade refrigeration system
 - ii) Necessity of air-cooling in aero plane
 - iii) Boot-Strap air cooling system
 - iv) Compare simple vapour compression with multistage vapour compression cycle
 - v) DART

Section B

- Q.6 a) Explain Domestic Electrolux with neat sketch. 06

- b) Distinguish between vapour absorption refrigeration systems with vapour compression refrigeration system. 07

- Q.7 a) Explain the desirable properties of refrigerants. 06

- b) What are the secondary refrigerants? Where it is used? Explain its importance in Ice manufacturing plants. 07

- Q.8 a) Explain the following terms 06

- i) By-pass factor
- ii) RSHF
- iii) GRSHF

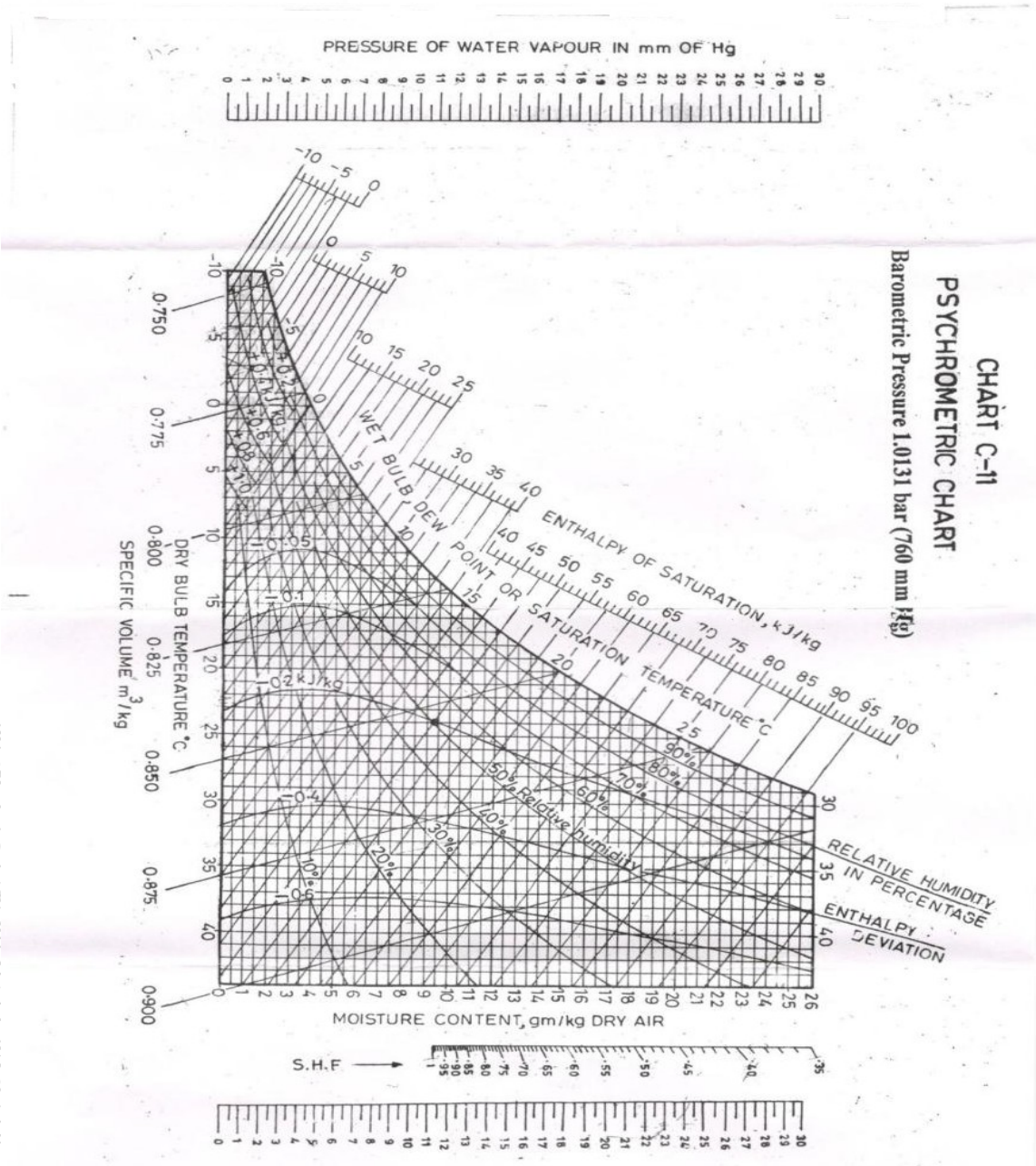
- b) The humidity ratio of atmospheric air at 28°C dry bulb temperature and 760mm of mercury is 0.016kg/kg of dry air. Determine: 07
1. Partial pressure of water vapour
 2. Relative humidity
 3. Dew point temperature
 4. Specific enthalpy

- Q.9 An air conditioned hall is to maintained at 27°C dry bulb temperature and 21°C wet bulb temperature. It has a sensible heat load of 46.5kW and latent heat load of 17.5kW . The air supplied from outside atmosphere at 38°C dry bulb temperature and 27°C wet bulb temperature is $25 \text{ m}^3/\text{min}$, directly in to room through ventilation and infiltration. Outside air to be conditioned is passed through the cooling coil whose apparatus dew point is 15°C . The quantity of re-circulated air from the hall is 60%. This quantity is mixed with the conditioned air after cooling coil. Determine:- 13

1. Condition of air after the coil and before the re-circulated air mixes with it;
2. Condition of air entering the hall i.e after mixing with re-circulated air;
3. Mass of fresh air entering the cooler;
4. By-pass factor of cooling coil
5. Refrigerating load on the cooling coil.

Q.10 Write short note on (any three)

- i) GWP and ODP
- ii) Domestic Refrigerator
- iii) Lithium-Bromide vapour absorption system
- iv) Cold storage
- v) Sling psychrometer



Total No. of Printed Pages:1

SUBJECT CODE NO:- H-221
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II: Machine Tool Design
[Revised]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B (a) This question paper contains 10 questions divided into two sections, namely A and B.
 (b) Attempt three questions from each section.

SECTION A

- Q.1 a) Explain working & auxiliary motions in machine tools. 07
 b) Explain Hydraulic of machine tool selection. 06
- Q.2 a) What are forces acting on tool in milling process? 07
 b) What are the trends of development of future machine tool? 06
- Q.3 a) Explain stepless regulation of speed, feed rates. 06
 b) What are the various steps for selection of best structural diagram? 07
- Q.4 a) What are various profiles of machine tool structure? 07
 b) Explain design criteria of machine tool structures 06
- Q.5 Write short note on following 14
 a) Design of column
 b) Design of speedbox

SECTION B

- Q.6 a) What are the various shapes of slideways? Show neat sketches of slideways profiles. 07
 b) What are the function and requirement of guideways? 06
- Q.7 a) Describe open type and closed type antifriction bearing. 07
 b) Explain function and requirements of spindle and spindle supports. 06
- Q.8 a) Explain material for spindle. 06
 b) What are the material for guideways. 07
- Q.9 a) Explain dynamic characteristics of elements & system. 07
 b) What are the effect of machine tool complices on machining accuracy? 06
- Q.10 Write short note on following: 14
 a) Equivalent elastic system.
 b) Forced vibration of machine tool.

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-222
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II: Computational Fluid Dynamics
[Revised]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B i) Question No.1 from section A and Question No.6 from section B are compulsory. Solve any TWO from remaining in each section.
 ii) Assume suitable data, if necessary.
 iii) Figures to the right indicate full marks.

Section A

- | | | |
|-----|--|----|
| Q.1 | a) Define CFD and its application in solving industrial problems. | 05 |
| | b) What are the governing equations of fluid flow and heat transfer in CFD | 05 |
| Q.2 | a) What are the different mathematical properties of fluid dynamics equations? | 08 |
| | b) Evaluate finite difference method for subsonic flow | 07 |
| Q.3 | a) Define structured grids and explain the generation of structure grids | 08 |
| | b) Explain implicit time dependent method for inviscid flows | 07 |
| Q.4 | a) Explain Delany triangulation for grids | 08 |
| | b) Explain conservative upwind discretization for hyperbolic equations | 07 |
| Q.5 | Write short notes on the following: (any Three) | 15 |
| | a) Finite element Method | |
| | b) Strong and weak formulation of boundary value problems | |
| | c) QUICK differencing scheme | |
| | d) Classification method for simple PDE's | |

Section B

- | | | |
|-----|--|----|
| Q.6 | a) Define and classify types of meshing | 05 |
| | b) Pressure correction equation by SIMPLE algorithm. | 05 |
| Q.7 | a) Derive finite difference scheme for steady state one-dimensional conduction problem with source term. | 08 |
| | b) Different Solvers used to solve CFD code. | 07 |
| Q.8 | a) Derive 1-D steady state diffusion equation by using finite volume method | 08 |
| | b) Enlist various commercial software used for solving CFD Code. | 07 |
| Q.9 | a) Write steady and transient 1-D conduction equation in conservative and non-conservative form. | 08 |
| | b) Explain cellcentred formulation techniques by Lax-Vendorofftime stepping | 07 |

Q.10 Write short notes on the following (any Three)

- a) Inlet and outlet boundary conditions.
- b) Errors and uncertainty in CFD
- c) Time Marching Problems.
- d) Phenomenon of laminar to turbulent flow.

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-223
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II: Industrial Engineering
[Revised]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
1. Solve any three questions from each section.
 2. Figures to the right indicate full marks
 3. Assume suitable data, wherever required and state it clearly.
- Section -A
- Q.1 a) Explain basic and excess work content? What are the reasons for excess work content? 07
- b) Enlist the factors influencing productivity. Explain how each factor will affect productivity. 06
- Q.2 a) Explain in brief – i) flow diagram and ii) Two handed process chart. 06
- b) State and explain in brief the steps involved in method study procedure. 07
- Q.3 a) A describe briefly 'SIMO chart' and state its application. 07
- b) Critical examination forms the basis for methods improvement.Explain. 06
- Q.4 a) Define micro motion study and state its objective. 07
- b) State the principles of motion economy related to i) work place layout ii) Use of Human body. 06
- Q.5 Write short note on the following (any two) 14
- i) Methods of job evolution
 - ii) Various allowances considered while building the standard time
 - iii) Merit rating methods

Section – B

- Q.6 a) Define work sampling. Also mention the procedure for conducting a work sampling study. 07
- b) Explain method time measurement (MTM) technique for work measurement. Also discuss conventions for recording MTM data. 07

- Q.7 a) Explain synthetic rating and analytical estimating techniques. 07
- b) Define predetermined motion time analysis (PMTS). Also explain factors to be considered while using PM TS. 06

- Q.8 a) Explain Toyota production system 07
- b) Write a short note on push and pull system in JIT 06

- Q.9 a) Describe Kaizen umbrella for quality improvement. 07
- b) Explain Kaizen in relation with innovation and PDCA cycle. 06

- Q.10 a) Define single minute exchange of dies. Discuss its procedure and effects. 07
- b) Explain the working of Kanban system. 06

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-224
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II: Tribology
[Revised]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B (i) Attempt any three questions from each Section.
(ii) Figures to the right indicate full marks.
(iii) Assume suitable data, if necessary.
- Section A

- | | | |
|-----|--|----------|
| Q.1 | (a) Define the term “Tribology”. Discuss basic principles of tribology.
(b) Explain economic role of wear. | 08
05 |
| Q.2 | (a) What are the laws of friction with exceptions for each law?
(b) Explain junction growth theory in friction. | 07
06 |
| Q.3 | (a) Discuss the effect of surface roughness and sliding velocity on coefficient of friction between two surfaces.
(b) Enumerate different types of wear. | 08
05 |
| Q.4 | (a) Write short note on wear mechanism and also mention various methods of wear measurement.
(b) Discuss the importance of Tribology in engineering. How it is helpful in minimizing wear and friction. | 07
06 |
| Q.5 | Short notes on any two
(a) Wear mechanism and various methods of wear measurement.
(b) Adhesion and abrasive theory of friction
(c) Economic benefits of tribology. | 14 |

Section B

- | | | |
|-----|--|----------|
| Q.6 | (a) How do you characterize a surface?
(b) Explain in short the following terms of lubrication
(i) Viscosity Index (ii) Kinematic Viscosity (iii) Absolute Viscosity | 07
06 |
| Q.7 | (a) Explain any one method of surface roughness measurement.
(b) Explain the Elasto-Hydrodynamic in detail. State the different examples of it. | 06
07 |
| Q.8 | (a) Derive the Reynold’s equation in two dimensions.
(b) What do understand by infinitely long journal bearing and Infinitely short journal bearing. | 08
05 |

- Q.9 A 360° hydrodynamic short journal bearing is to be designed to support a radial load of 5.5KN. The rotation of journal is 5000 rpm. The eccentricity ration is 0.6.If the viscosity of lubrication oil is 45×10^{-9} Ns/mm² and supplied at a rate of 0.51lit/min to the bearing. Determine the dimensions of the journal bearing and minimum oil film thickness take I/d rations 1.4. 13
- Q.10 Write short note (any two) 14
- (a) Lubrication systems.
 - (b) Factors influencing the selection of lubricants.
 - (c) Adhesion produced by surface tension.

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-225
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II: Piping System Engineering
[Revised]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.:(i) Solve any three questions from each Section.
(ii) Use of data book/property tables is permitted.
(iii) Marks are reserved for figures, charts, graphs wherever necessary.
(iv) Assume suitable data if required.

Section A

- | | | |
|-----|---|----|
| Q.1 | A. Describe ASME 31.4 and ASME 31.5 codes in piping. | 06 |
| | B. Explain the scope of piping engineering. | 07 |
| Q.2 | A. Sketch commonly used pipe fittings, flanges & fasteners. | 06 |
| | B. Discuss what is Pressure Temperature (P-T) rating. | 07 |
| Q.3 | A. Explain economic velocity. | 06 |
| | B. How will you determine the pressure drop for compressible and non-compressible fluids? | 07 |
| Q.4 | A. Explain different types of elbows, Tee(T). | 06 |
| | B. Describe methods of pipe network analysis. | 07 |
| Q.5 | Write Short notes on (Any Two) | 14 |
| | 1. Safety valves | |
| | 2. Fasteners | |
| | 3. Threaded joints | |

Section B

- | | | |
|-----|---|----|
| Q.6 | A. Enlist ASME/ANSI/API standards for piping materials. | 06 |
| | B. Explain selection, properties and use of piping materials for cryogenic systems. | 07 |
| Q.7 | A. Sketch a sample P&ID diagram of fluid storage and distribution for simple application. | 06 |
| | B. Explain piping isometrics with neat sketch. | 07 |
| Q.8 | A. Explain costing for piping networks. | 06 |
| | B. Discuss how CADD (Computer Aided Design and Drafting) is used in PFD & P&ID preparation. | 07 |

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-226
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II: Automotive Technology
[Revised]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B.:i) Q.1 & Q.6 are compulsory.

ii) Solve any two questions from remaining questions from each section.

iii) Assume suitable data if required.

SECTION A

- | | | |
|-----|--|----|
| Q.1 | (a) Determine:-
i) Stopping distance
ii) The Acceleration
iii) Stopping time
iv) Energy dissipated
For a lightweight track weighting 1300 kg travelling at 100 Km/hr. Assume constant deceleration, ignore other resisting forces. The steady braking force applied is 9500N. | 08 |
| | (b) Define:-
i) Vehicle Dynamics
ii) Oversteer | 02 |
| Q.2 | a) Compare four wheel drive & two wheel drive vehicle. | 08 |
| | b) How the aerodynamic drag of the vehicle can be reduced? Explain with neat sketches. | 07 |
| Q.3 | (a) A vehicle of total weight 49050,N is held at rest on a slope of 10° . It has a wheel base of 2.25m & centre of gravity 1m in front of rear axle & 1.5 m above the ground level, find
i) The normal reactions at the wheels.
ii) Assuming that sliding doesn't occur First, what will be the angle of slope so that vehicle will overturn.
iii) Assuming all the wheels are to be braked, what will be the angle of slope so that the vehicle will begin to slide if $\mu=0.35$. | 08 |
| | (b) Explain the construction of Piston with a neat sketch. | 07 |
| Q.4 | a) Explain the exhaust system of turbocharger engine. | 08 |
| | b) What is the difference between Full time 4WD & part time 4WD? What are the | 07 |

indirect systems of the vehicle?

- Q.5 a) What is meant by oversteer condition? How slip angle affects it explain with neat sketch. 08
 b) Explain cooling system of the engine. 07

SECTION B

- Q.6 a) A car has mass of 500kg & velocity of 10m/s. Contact time during collision of two vehicles is 1 second. Calculate force transmit towards the driver. 02

- b) Explain Antilock braking system in detail. 08

- Q.7 a) Explain smart access key in detail. 06
 b) What is Automatic climate control technology? Explain Air conditioning system of the vehicle. 09

- Q.8 a) Explain Air suspension system of vehicle with a neat sketch. 08
 b) Compare series & parallel hybrid vehicle. 07

- Q.9 a) Fuel cell vehicle is it a zero pollution vehicle? Explain it with a neat sketch. 09
 b) Enlist the National & International Safety Standards. 06

- Q.10 a) How the crash sensor works in accidental condition? Explain airbag system in detail. 08
 b) Explain the charging system of the vehicle. 07

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-227
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-II)
Elective-II
Advanced Vibrations & Noise Control
[Revised]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B.:

- 1) Attempt any three questions from each Section.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Section A

- Q.1 a) What do you understand by under-damped system, over damped system and critically damped system? Explain. 06
- b) A 25 kg. Mass is resting on a spring of 5 kN/m stiffness and a dashpot of 150 N-s/m damping coefficient in parallel. If a velocity of 0.1 m/s is given to the mass at rest position. What will be its displacement from the equilibrium position at the end of first second? 08
- Q.2 a) Explain Rayleigh method for determination of natural frequency of a vibratory system. 07
- b) Explain Dunkerley method for frequency of oscillation. 06
- Q.3 The rotor of a turbo super charge of mass 9 kg is keyed to the centre of a 25min diameter steel shaft 40 cm between bearings. Determine: 13
- i) The critical speed of shaft
 - ii) The amplitude of vibration of the rotor at a speed of 3200 rpm, if the eccentricity is 0.015 mm.
 - iii) The vibratory force transmitted to the bearings at this speed. Assume the shaft to be simply supported and the shaft material has a density of $8 \times 10^3 \text{ kg/m}^3$. Take $E = 2.1 \times 10^{11} \text{ N/m}^2$. What are the application of tuned absorbers.
- Q.4 a) Explain Transverse vibration of beams. 07
- b) Explain Undamped free vibration of two degrees of freedom system and principal modes of vibrations. 07
- Q.5 Write short note on any three. 13
- a) Half power method
 - b) Single degree of freedom
 - c) Holzers and prohl method
 - d) Vibration measuring instruments.

Section B

- Q.6 a) Explain the following terms. 06
- i) Sound spectra
 - ii) One octave band
 - iii) One third octave band analysis
- b) Explain the term loudness. How does it vary with the frequency? How this variation is taken into account in the subjective assessment. 08
- Q.7 An octave band analysis on an automatic wood lathe in operation. It was found that octave band sound pressure level here 93 db at 250Hz, 94db at 500Hz, 96db at 1000Hz, 96db at 2000Hz, 94 db at 4000 Hz and 93db at 8000Hz. What is total mean square pressure. 13
- Q.8 a) Explain the terms 08
- 1) Seismometer
 - 2) Matlab software
- b) What are the steps in FEA? 06
- Q.9 a) Discuss various methods for controlling industrial noise. 07
- b) What is Beat phenomena? Explain why we need octave band. 07
- Q.10 Write detailed notes on any three of the following:- 13
- a) The decibel scale
 - b) LDV
 - c) Noise standards and Limits
 - d) Industrial noise control

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-304
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
I.C. Engines
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B.:i) Solve any three questions from each section.

ii) Figures to the right indicate full marks.

iii) Assume suitable data, if necessary.

Section– A

- | | | |
|-----|--|----|
| Q.1 | a) What are the important basic components of IC engines? Explain them briefly. | 07 |
| | b) What is the basic difference between an otto cycle & Diesel cycle? Derive the expression for the efficiency of the diesel cycle. | 07 |
| Q.2 | a) Briefly explain | 07 |
| | (i) Time loss factor | |
| | (ii) Exhaust blow down factor | |
| | b) Enlist different types of nozzles used in Fuel injection system? Explain multihole nozzle with neat sketch. | 06 |
| Q.3 | a) Briefly discuss the air Fuel mixture requirements of a petrol engine from no load to full load. | 07 |
| | b) Enlist possible alternative fuels for IC engines. Explain alcohols as an alternative fuels for IC engines bringing out their merits & demerits. | 06 |
| Q.4 | a) Briefly explain the stages of combustion in SI engines, elaborating the flame front propagation. | 07 |
| | b) What is meant by abnormal combustion? Explain the Phenomenon of knock in SI engines. | 06 |
| Q.5 | a) State different combustion chambers used in SI engine. Explain any one with neat sketch. | 07 |
| | b) What do you understand by octane rating? Explain its effect on SI engine knocking. | 06 |

SECTION B

- | | | |
|-----|--|----|
| Q.6 | a) What is delay period in CI engine? What are the factors that affect it? | 07 |
| | b) Explain the phenomenon of knock in CI engines and compare it with SI engine knock. | 07 |
| Q.7 | a) Enlist Direct and Indirect injection type combustion chambers used in CI engines? Explain Hemispherical combustion chamber with neat sketch | 07 |
| | b) What are the limitations of supercharging in IC engines. | 06 |

- Q.8 a) Explain the parameters by which performance of an engine is evaluated. 06
 b) The following data were recorded from a test on a single cylinder Four Stroke oil engine cylinder bore=150mm; engine stroke=250mm; area of indicator diagram=450mm²; length of indicator diagram = 50mm indicator spring rating = 1.2mm; engine speed = 420 rpm; brake torque = 217 Nm. Fuel consumption = 2.95 kg/h; Calorific value of Fuel = 44,000 kJ/kg. Calculate
 i) Mechanical efficiency
 ii) brake thermal efficiency
 iii) indicated thermal efficiency
 iv) brake specific fuel consumption 07
- Q.9 Write short notes on (any Two) 13
 a) HCCI engine
 b) Wankel engine
 c) Microprocessor based engine
- Q.10 a) Discuss the emissions from diesel engine on what factors these emissions depend? 07
 b) What is EGR? Explain how it reduces the NO_x emissions. 06

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-338
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Automatic Control System
[OLD]

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

N.B

- i. Attempt any three questions from each section.
- ii. Use semi log paper and graph paper is allowed.
- iii. Make necessary assumption and state them clearly
- iv. Figures to the right indicate full marks.

Section A

- | | | |
|-----|--|----|
| Q.1 | a) Explain the terminologies related to control system. | 06 |
| | b) How does one convert an open loop system to a closed loop system? Explain with examples. | 07 |
| Q.2 | a) Obtain the overall transfer function for given system shown in Fig.1 using B.D. reduction techniques. | 06 |

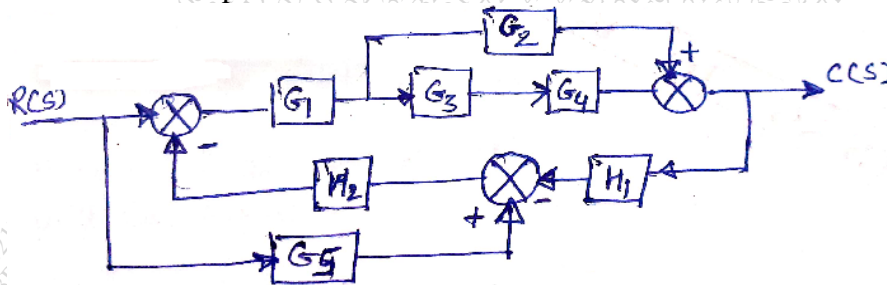


Fig1

- | | | |
|-----|--|----|
| | b) What is Block diagram? What are the elements of Block diagram? | 07 |
| Q.3 | a) Draw signal flow graph of the system shown in fig 2 and obtain overall transfer function of system using MGF. | 08 |

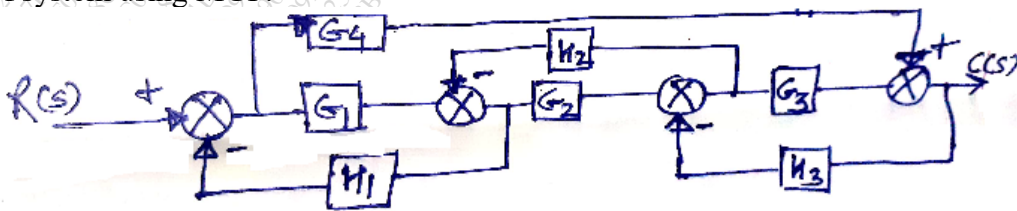


Fig2

- b) Explain time varying and time invariant system with example. 05
- Q.4 a) Explain force voltage and force current analogy. 07
 b) Compare AC and DC servomotor. 06
- Q.5 Write short notes on Any three: 14
 a) Thermal system.
 b) Servomechanism.
 c) Pneumatic PID controller.
 d) Mathematical modeling of control system.
 e) ON off controller.

Section B

- Q.6 a) Discuss the response of first order system to unit step input. 07
 b) Define the following terms: 06
 i) Damping ratio.
 ii) Natural frequency of oscillations.
 iii) Time constant.
- Q.7 a) What do you mean by steady state response? Also obtain expression for steady state error. 07
 b) Find steady state error due to step and unit Ramp input for unity negative feedback system whose OLTF is $G(s)H(s) = \frac{K}{s(s+1)}$ 06
- Q.8 a) Determine the no of roots on the imaginary axis for $s^5 + 6s^4 + 15s^3 + 30s^2 + 44s + 24 = 0$ 07
 b) A system is given by differential equation 06
 $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 8y(t) = 8X$
 Determine all time response specifications for unit step input. Also write down response equation c(t).

- Q.9 A unity feedback system has 13
 $G(S)H(S) = \frac{100(S+3)}{s(s+1)(s+5)}$ Draw Bode plot and comment on stability.

- Q.10 a) Sketch root LOCUS for, $K>0$, $G(S)H(S) = \frac{K(S+2)}{(S+1+j\sqrt{3})(S+1-j\sqrt{3})}$ 10
 b) Explain Nyquist stability criterion. 04

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-373
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Metrology and Quality Control
[OLD]

[Time: Three Hours]

[Max. Marks:80]

N.B. Please check whether you have got the right question paper.

- 1) Solve any three questions from each section.
- 2) Figure to the right indicates full marks.
- 3) Assume suitable data if required.
- 4) Use of non-programmable calculator is allowed.

Section – A

- | | | |
|-----|---|----|
| Q.1 | a) Explain and differentiate Linear and Angular measurement. | 05 |
| | b) Define the following terms: | 08 |
| | 1) Accuracy | |
| | 2) Reproducibility | |
| | 3) Sensitivity | |
| | 4) Readability | |
| Q.2 | a) What is surface finish measurement? Explain any one of the equipment for surface finish measurement. | 07 |
| | b) Draw a neat sketch of NPL flatness interometer and explain in detail. | 06 |
| Q.3 | a) Explain the Gear Terminology with the help of neat diagram. | 07 |
| | b) List down the possible sources of errors in gear manufacturing and name their types. | 06 |
| Q.4 | a) Explain LVDT in detail with neat sketch. | 07 |
| | b) Explain the use of laser in metrology. | 06 |
| Q.5 | Write short notes: (Any three) | 14 |
| | a) Co-ordinate Measuring Machine | |
| | b) Gear Tooth Vernier | |
| | c) Tool marker's microscope | |
| | d) Sine bar-Sine center | |

Section – B

- | | | |
|-----|---|----|
| Q.6 | a) Explain cost of quality and value of quality | 06 |
| | b) Explain 5S and what are its benefits? | 07 |
| Q.7 | a) Explain Poka Yoke in detail. | 06 |
| | b) Explain Kanban in detail. | 07 |
| Q.8 | a) Explain the importance and use of statistical quality control. | 07 |
| | b) Explain the use of control chart for variable and attribute. | 06 |

- Q.9 a) What is quality circle? Explain in details.
- b) Explain the process of capability.

07
06

Q.10 Write short notes on: (Any three)

- a) Value engineering
- b) Sampling methods
- c) Pareto Analysis
- d) Brain Storming

14

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-407
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Turbo Machines
[OLD]

[Time:Three Hours]**[Max.Marks:80]**

Please check whether you have got the right question paper.

- N.B
1. Solve any three questions from each section.
 2. Figures to the right indicate full marks.

Section A

- Q.1
- a) Define a turbo machine and give the classification in brief. 06
 - b) Explain how the principle of dimensional analysis is applied to the turbo machines and explain their significance. 07
- Q.2
- a) A jet of water of diameter 80 mm moving with a velocity of 27 m/s strikes a fixed plate in such a way that the angle between the jet and plate is 60° . Find the force exerted by the jet on the plate. 07
 - i) In the direction normal to the plate
 - ii) In the direction of the plate
 - b) Show that a curve radial vane work done per second is given by $paV[V_{w1u1}V_{w2+u2}]$ the notation carry usual meaning. 06
- Q.3
- a) A jet of water of direction 53 mm having a velocity of 22 m/s strikes a curved vane which is moving with a velocity of 11 m/s in the direction of the jet. The jet leaves the vane at an angle of 60° to the direction of moving of vane at outlet. Determine
 - i) The force exerted by the jet on the vane in the direction of motion
 - ii) Work done per second by the jet,
 - b) Define and explain hydraulics efficiency, mechanical efficiency and overall efficiency of a turbine. 06
- Q.4
- a) What do you mean by the characteristics curve of turbine? Name the important types of characteristics curves. 06
 - b) A Peltonwheel is to be designed for a head of 65 m when running at 205 rpm. The Pelton wheel develops 100 KW shaft power. The velocity of buckets = 0.47 times the velocity of the jet, overall efficiency = 0.85 and co-efficient of the velocity is equal to 0.98. Find
 - i) Diameter of jet
 - ii) Diameter of wheel
 - iii) Width and depth of buckets
 - iv) Number of buckets on the wheel.

- Q.5 Write short notes (any two): 14
- Types of draft tubes and its significance
 - Kaplan turbine
 - Pelton wheel turbine
 - Selection of turbine for particular case

Section B

- Q.6 a) What are the effects of cavitations? Give the necessary precaution to avoid cavitation. 06
- b) A centrifugal pump is to discharge $0.12\text{m}^3/\text{s}$ at a speed of 1440 rpm against a head of 27 m. 07
the impeller is 260 mm, its width at outlet is 55 mm and manometric efficiency is 77%.
Determine the vane angle at the outer periphery of the impeller.

- Q.7 In a single row wheel impulse turbine the mean diameter of the blades 1.1 m and the speed is 300 13
rpm, the nozzle angle is 20° and the ratio of blade speed to steam is 0.46 and the relative velocity
and outlet from the blades to that at inlet is 0.87. The outlet angle is made 3° less than the inlet
angle. The steam flow is 12 kg/s. draw the velocity diagram for the blade and determine the
following
- Tangential thrust on the blades
 - Axial thrust on the blade
 - Power developed in the blades
 - Blade efficiency

- Q.8 An adiabatic steam nozzle is to be designed for a discharge rate of 12kg/s of steam from 12 bar and 13
4050 to a back pressure of 1.1 bar. The nozzle efficiency is 0.92 and the frictional loss is assumed to
take place in the diverging portion of the nozzle only. Assume a critical pressure ratio of 0.5457.
Determine the throat and exit areas.

- Q.9 a) Discuss the influence of reheating, regeneration and inter-cooling on the performance of the 06
gas turbine cycle.
- b) Why is compounding of steam necessary? Describe with neat sketch the pressure 07
compounding of steam turbine.

- Q.10 Write short notes (any two): 14
- Priming in centrifugal pump
 - Stirling cycle
 - Nozzles and diffusers
 - Application of gas turbines

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-450
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I: Energy Conservation and Management
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.: 1) Solve any two questions from each Section.
 2) Figures to the right indicate full marks.
 3) Q.5 and Q.10 are compulsory.
 4) Assume suitable data, if necessary.

Section -A

- | | | |
|-----|--|----|
| Q.1 | a) What is energy conservation and its importance? | 06 |
| | b) Explain with example Clean Development Mechanism (CDM)? | 07 |
| Q.2 | a) Explain with examples the primary energy resources. | 06 |
| | b) Explain with examples commercial and non-commercial energy. | 07 |
| Q.3 | a) What are the various energy conservation opportunities in boilers and steam distribution systems? | 06 |
| | b) Explain the energy conservation with reference to the compressed air systems and pumps? | 07 |
| Q.4 | a) What is cogeneration, explain the principle with example? | 06 |
| | b) Explain briefly the factors for selection and control strategies for the cogeneration systems. | 07 |
| Q.5 | Write short notes on the following.(Any two) | |
| | a) Techno-economic advantages of cogeneration technology | 07 |
| | b) Kyoto Protocol | 07 |
| | c) Energy Pricing | 07 |

Section- B

- | | | |
|-----|---|----|
| Q.6 | a) Explain Demand Side Management (DSM). | 06 |
| | b) What is Load scheduling and its need to schedule the load? | 07 |
| Q.7 | a) Explain the types of energy audit. | 06 |
| | b) Enlist energy audit instruments. Explain with neat sketch any two in detail. | 07 |
| Q.8 | a) Explain various energy audit approaches. | 06 |
| | b) Explain energy audit of sugar industry. | 07 |

- Q.9 a) Explain life cycle cost with example. 06
- b) What are simple payback period and internal rate of return? 07

- Q.10 Write short notes on the following: .(Any two)
- a) Return on investment 07
- b) Power factor improvement 07
- c) Variable speed drive 07

Total No. of Printed Pages:01

SUBJECT CODE NO:- H-451
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I: Power Plant Engineering
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.: 1) Question no. 1 and 6 are compulsory.
 2) Solve any two questions from remaining questions in each Section.

Section A

- Q.1 a) Discuss future trends in power industry. 06
 b) A power station supplies loads to consumer as per follows. 06

Time (Hrs)	0-6	6-10	10-12	12-16	16-20	20-24
Load (mw)	30	50	70	60	80	40

Draw load curve and estimate load factor.

- Q.2 a) Explain Belt conveyor & screw conveyor. 07
 b) Describe central bin system of pulverized coal handling. 07
- Q.3 a) Explain various ash handling system. 07
 b) Describe the layout of modern thermal power plant. 07
- Q.4 a) What is Stoker? Explain chain grate stoker. 07
 b) Describe supercharging of diesel engine. 07
- Q.5 a) Enlist advantages and disadvantages of diesel engine power plant. 07
 b) Describe cooling system for diesel engine. 07

Section B

- Q.6 a) Describe various methods for applying tariff for electrical energy. 08
 b) Explain hydrograph. 04
- Q.7 a) Discuss the advantages and disadvantages of Hydroelectric power plant. 07
 b) What is spillway? Explain different types of spillways. 07
- Q.8 a) Justify selection of prime mover plays vital role in performance of Hydro-electric power plant. 07
 b) Explain Pelton turbine. 07
- Q.9 a) Explain nuclear fission and fusion chain reaction. 07
 b) Discuss with neat sketch SGR. 07
- Q.10 a) Discuss advantages and disadvantages of nuclear power plant. 07
 b) Describe the BWR with a neat diagram. 07

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-452
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I: Production Planning and Control
[OLD]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- 1) Solve any three questions from each section.
 - 2) Use of non – programmable calculator is permitted.
 - 3) Assume suitable data, if required, clearly stating the relevant assumptions made.

Section A

- Q.1 a) Draw typical internal organization chart of PPC used in industry. 07
- b) Briefly explain the action and control phase in PPC. 07
- Q.2 a) Write on benefits of Production Planning and Control in any industry. 05
- b) Explain any 4 types of qualitative techniques used in sales forecasting. 08
- Q.3 a) Briefly explain least square method and correlation in sales forecasting. 06
- b) The following shows the year and demand of the particular company for 10 months. 07

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct
Demand	110	100	100	120	130	140	130	140	150	160

Determine the

- a) Curves for 3 months and 5 months moving average
 - b) Find the trend for the November
 - c) Determine the Mean absolute deviation
- Q.4 a) Describe the P system of selective control techniques with suitable graph. 06
- b) The annual requirement of the raw material of a company is 50 tonnes. The cost of raw material is Rs 500 per ton. The ordering cost is Rs 100 per order and the carrying cost is 20% of unit cost per year. 07
- Determine the
- a) EOQ
 - b) Total Inventory cost
 - c) Increase in inventory cost if EOQ is 25 tonnes

- Q.5 a) Following table shows the incomplete material requirement planning (MRP-1) of XYZ Company, final goods. Calculate the MRP and shows when planned order release to be made

Lead time = 5; Order quantity = 250

Requirements		0	40	0	100	0	0	90	0
Scheduled receipts									
On hand	160								
Planned order Release									

- b) Explain in detail MRP I (Material Requirement Planning) and ERP (Enterprise Resource Planning)

Section B

- Q.6 a) A job production unit has 4 jobs A, B, C, D which can be manufactured on each of the 4 machines P, Q, R, S. the processing cost of each of each job for each machine is given in the table below.

	Machines				
Jobs		P	Q	R	S
A		31	25	33	29
B		25	24	23	24
C		19	21	23	24
D		38	36	34	40

The achieve min processing cost, which job will you assigned on which machine?

- b) Define scheduling? Write on assignment and sequencing method of scheduling.

- Q.7 a) Discuss five key principles used in Lean production.

- b) Explain the elements of JIT manufacturing.

- Q.8 a) Define loading and differentiate between loading and routing.

- b) Write on activities of dispatcher and dispatching procedure.

- Q.9 a) Write on Route sheets and Bill of materials.

- b) Write on how existing plant is transformed to lean production system.

- Q.10 Write a short notes on any two

- a) Line balancing
- b) Expediting
- c) Chase planning
- d) Setup time reduction technique

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-453
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I: Advanced Materials and Manufacturing
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.:1) Solve any two questions from each section.
 2) Question No.5 & 9 are compulsory
 2) Draw neat sketch wherever required.
 3) Figures to right indicate full marks.
 4) Assume suitable data wherever required.

Section -A

- | | | |
|-----|--|----|
| Q.1 | a) One of the element in composites is matrix material what characteristics does matrix material should have explain its significance in composites. | 06 |
| | b) With the example explain metal matrix composites. | 07 |
| Q.2 | a) What is rule of mixtures? Explain with example. | 07 |
| | b) What is hybrid composites? Explain the concept with example. | 06 |
| Q.3 | a) Thermoplastic polymer is replacing many other material explain why? | 06 |
| | b) Explain with neat sketch forming technique of polymer. | 07 |
| Q.4 | a) Machining is done with cutting tools. Explain HSS-tool material. | 07 |
| | b) What is magnetic materials? Explain with example. | 06 |
| Q.5 | Write short note on any two. | 14 |
| | i) Refractory material | |
| | ii) Cement and concrete | |
| | iii) Elastomer | |

Section- B

- | | | |
|-----|--|----|
| Q.6 | a) How evaporative casting process is carried out? Explain. | 07 |
| | b) What are casting defects and how they can be eliminated? | 06 |
| Q.7 | a) How physical vapor deposition process is carried out? Explain. | 07 |
| | b) How is the setup for EDM process? Explain its principle. | 06 |
| Q.8 | a) What are the parameters affecting water jet machining? Explain. | 07 |
| | b) With neat sketch explain SLS process. | 06 |

Total No. of Printed Pages:1

SUBJECT CODE NO:- H-454
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I: Modern Management Techniques
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B.:i) Q.1 and Q.6 are compulsory.
 ii) Solve any two questions from Q.2 to Q.5 in Section A.
 iii) Solve any two questions from Q.7 to Q.10 in section B.
 iv) Draw neat sketches wherever necessary.

Section– A

- | | | |
|-----|---|----|
| Q.1 | a) Define TQM and explain Dimensions & Quality with examples. | 08 |
| | b) Enlist seven new QC tools and explain any two with neat sketch& examples. | 08 |
| Q.2 | a) How do you will explain new and old quality cultures in an Industry? | 06 |
| | b) Define six sigma& explain DMADY method for new product development with example. | 06 |
| Q.3 | a) Explain the role of setup time and lot size in JIT with example. | 06 |
| | b) How do you will use Five why process for analyzing bike start issue? | 06 |
| Q.4 | a) Define and explain Kaizen with suitable example. | 06 |
| | b) Define SMED and explain it with example. | 06 |
| Q.5 | a) Define and explain phases of six sigma with example. | 06 |
| | b) Define & explain pokayoke with example. | 06 |

Section – B

- | | | |
|------|--|----|
| Q.6 | a) Define value Engineering & explain steps in value analysis. | 08 |
| | b) Define & Explain FAST analysis with examples. | 08 |
| Q.7 | Define & Draw complete QFD diagram with suitable example and explain it. | 12 |
| Q.8 | a) Explain twelve steps of TPM with examples | 06 |
| | b) Explain stages of TPM development with example. | 06 |
| Q.9 | a) Differentiate creativity and innovation with suitable examples. | 06 |
| | b) Explain the role of management for creativity & innovation. | 06 |
| Q.10 | a) Explain the managerial role for improving QWL with example. | 06 |
| | b) Differentiate QWC & WLB with example. | 06 |

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-455
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical) (Sem-I)
Elective-I: Non-Conventional Energy System
[OLD]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicate full marks
 - 3) Assume suitable data, if required
- Section – A**
- Q.1 a) What is energy scenario? Explain Indian energy scenario. 07
b) Classify different energy resources. 06
- Q.2 a) Derive derivation for performance analysis of flat plate collector. 07
b) Enlist different types of concentrating collectors. Explain with neat sketch any one type of it. 06
- Q.3 a) Describe the principle of working of solar water heater with neat sketch. 07
b) Explain with neat sketch solar distillator. 06
- Q.4 a) Draw neat sketch of solar air heater and explain working of its different components. 07
b) List advantages and limitations of conventional and non- conventional energy sources. 06
- Q.5 Short notes on any three 14
a) Solar pond
b) Types of solar cells
c) Energy pricing in India
d) Beam and diffuse radiations

Section – B

- Q.6 a) What are safety and environmental aspects of wind energy? 07
b) Explain in detail Horizontal axis wind machine with neat sketch. 06
- Q.7 a) Discuss in detail the process of biochemical conversion. 07
b) With neat sketch explain Domestic Biogas plant. 06
- Q.8 a) Describe different types of geothermal power plants. 07
b) Explain principle of OTEC. 06
- Q.9 a) Write note on wave energy conversion devices. 07
b) How thermochemical conversion of biomass takes place? Explain. 06

- Q.10 Write short notes(any three)
- a) Applications of tidal energy
 - b) Forces on blades of wind turbine
 - c) Biomass conversion process
 - d) Ocean energy resources