

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-350**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**Fluid Mechanics & Machinery**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

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

- i) Attempt any three questions from each Section.
- ii) Assume suitable data, if necessary.
- iii) Draw a neat labelled sketch wherever necessary.

**SECTION – A**

- Q.1 a) A plate 0.25 mm distant from a fixed plate, moves at 60 cm/s and requires a force of 2N per unit area i.e.  $2 N/m^2$  to maintain this speed. Determine the fluid viscosity between the plates. 06
- b) A solid cylinder of diameter 4 m has a height of 4 m. find the metacentric height of the cylinder if the specific gravity of the material of the cylinder = 0.6 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable. 07
- Q.2 a) Derive 3 dimensional continuity equation for a steady, incompressible flow in Cartesian co – ordinates. 06
- b) A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. if the axis of the pipe turns through  $45^\circ$ , find the magnitude and direction of the resultant force at the bend. 07
- Q.3 The pressure difference  $\Delta p$  in a pipe of diameter  $D$  and length  $l$  due to viscous flow depends on the velocity  $V$ , viscosity  $\mu$ , density  $\rho$  and roughness  $k$ . Using Buckingham's  $\Pi$  theorem obtain an expression for  $\Delta p$ . 13
- Q.4 a) The ratio of lengths of a submarine and its model is 30:1. The speed of submarine (prototype) is 10 m/s. the model is to be tested in a wind tunnel. Find the speed of air in wind tunnel. Take the value of kinematic viscosities for sea water and air as 0.012 stokes and 0.016 stokes respectively. The density for sea – water and air is given as  $1030 kg/m^3$  and  $1.24 kg/m^3$  respectively. 06
- b) The resisting force  $R$  of a supersonic plane during flight can be considered as dependent upon the length of the aircraft  $l$ , velocity  $V$ , air viscosity  $\mu$ , air density  $\rho$  and bulk modulus of air  $K$ . Express the functional relationship between these variables and the resisting force. Use Rayleigh's method. 07

- Q.5 Answer any 2 of the following questions. 14
- Types of fluid.
  - State and derive hydrostatic law.
  - Assumptions of Bernoulli's equation.

**SECTION – B**

- Q.6 a) A jet of water of diameter 75 mm moving with a velocity of 30 m/s, strikes a curved fixed plate tangentially at one end at an angle of 30° to the horizontal. The jet leaves the plate at an angle of 20° to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical direction. 06
- b) A pelton wheel is to be designed for the following specifications: 07  
 Shaft power = 11772 kW, Head = 380 m, Speed = 750 rpm, Overall efficiency = 86%, jet diameter is not to exceed one – sixth of the wheel diameter. Determine:
- The wheel diameter
  - The number of jets required and
  - Diameter of the jet.

Take coefficient of velocity  $C_v = 0.985$  and Speed ratio = 0.45

- Q.7 a) A centrifugal pump is to discharge  $0.118 \text{ m}^3/\text{s}$  at a speed of 1450 rpm against a head of 25m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 06
- b) What is multistage centrifugal pump? What are its functions? Explain with neat sketches. 07
- Q.8 a) With a help of neat sketch explain the construction and working of Hydraulic Coupling. 06
- b) Write a note on performance characteristics of Centrifugal pump. 07
- Q.9 a) What is the function of draft tubes used in turbines? Name the types of draft tube. 04
- b) A conical draft tube having diameter at the top as 2.0m and pressure head at 7m of water (vacuum), discharges water at the outlet with velocity of 1.2 m/s at the rate of  $25 \text{ m}^3/\text{s}$ . If atmospheric pressure head is 10.3m of water and losses between the inlet and outlet of the draft tubes are negligible, find the length of draft tube immersed in water. Total length of tube is 5m. 09

- Q.10 Answer any 2 of the following questions. 14
- Explain Cavitation in pumps and turbines
  - Differentiate between Pelton, Francis and Kaplan turbine.
  - With a help of neat sketch, explain the construction and working of Hydraulic Crane.

Total No. of Printed Pages:03

**SUBJECT CODE NO: H-359**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech./Prod.)**  
**Thermodynamics-I**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

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

- 1) Q. No. 1 and Q. No. 6 are compulsory.  
 2) Solve any two questions from remaining questions in each section.  
 3) Use of steam table / mollier diagram is allowed.  
 4) Assume suitable data, if required.  
 5) Figure to the right indicates full marks.

**SECTION – A**

- Q.1 Solve any five 10
- a) Define heat Engine and refrigerator.
  - b) Define steady flow process. Write the steady flow energy equation on unit mass basis.
  - c) Define Carnot engine. Sketch the Carnot cycle on P – V and T – S diagram.
  - d) Define available energy and unavailable energy.
  - e) What is thermal energy reservoir? Define in terms of heat source and heat sink.
  - f) Air enters a convergent nozzle with a velocity of 40 m/s. The enthalpy of air decreases by 180 KJ/Kg. Determine the exit velocity. Assume adiabatic conditions in the nozzle.
- Q.2 a) Write down the general energy equation for steady flow system and simplify when applied for the following systems: 06
- i) Reciprocating compressor
  - ii) Heat Exchanger
- b) In a steam power plant, the steady flow conditions prevail, 3600 Kg of water per hour enters the boiler at a specific enthalpy of 840 KJ/ Kg and a speed of 300 m per minute at 5 m elevation. The water receives heat at a constant pressure in the boiler and increases specific enthalpy to 3140 KJ / Kg and then steam formed enters the turbine. The steam leaves the turbine at the speed of 3000 m / min at an elevation of 1 m and a specific enthalpy of 2640 KJ/ Kg. heat losses from the turbine and boiler are 72000 KJ / hr. determine the power output of the power plant. 09

- Q.3 a) A reversible refrigerator is used to maintain a space at a temperature of  $0^{\circ}\text{C}$ , when it rejects heat to the surroundings at  $27^{\circ}\text{C}$ . If the heat removal rate from the refrigerator is  $90 \text{ MJ / hr}$ . Determine the C.O.P of the system. 08
- b) A heat pump is used to maintain an auditorium hall at  $25^{\circ}\text{C}$  when the atmospheric temperature is  $10^{\circ}\text{C}$ . The heat load of the hall is  $1500 \text{ KJ/min}$ . Calculate the power required to run the actual heat pump if the C.O.P of the actual heat pump is 30% of the Carnot heat pump working between the same temperature limits. 07
- Q.4 a) State and prove Clausius inequality. 08
- b) Define Dead State. Explain Available and Unavailable Energy. 07
- Q.5 Write short note (any three): 15
- a) Flow process and control volume.
- b) Clausius theorem
- c) The increase of Entropy principle
- d) Performance of heat engines and reversed heat engines.

## SECTION – B

- Q.6 Solve any five 10
- a) Draw Dual cycle on P-V and T-S Diagram.
- b) Write limitations of Carnot cycle.
- c) Write a short note on mean effective pressure.
- d) Explain wet steam and dry steam.
- e) Define calorific value of fuel and its types.
- f) What do you mean by HCV and LCV?
- Q.7 An engine with 200 mm cylinder diameter 300 mm stroke works on theoretical Diesel cycle. The initial pressure and temperature of air used are 1 bar and  $27^{\circ}\text{C}$ . The cut-off is 8% of the stroke. 15
- Determine**
- i) Pressures and Temperatures at all silent points,
- ii) Theoretical air standard efficiency
- iii) Mean effective pressure
- iv) Power of the engine if the working cycles per minute are 380. Assume that compression ratio is 15 and working fluid is air. Consider all conditions to be ideal.

- Q.8 a) Explain the construction and working of separating calorimeter with neat sketch. 06
- b) Two boiler one with superheater and other without superheater are delivering equal quantities of steam into a common main. The pressure in the boilers and main is 20 bar. The temperature of the steam from a boiler with a superheater is 350°C and the temperature of the steam in the main is 250°C. Determine the quality of the steam supplied by the other boiler. Take  $C_{ps} = 2.25 \text{ KJ/Kg}$ . 09
- Q.9 a) What is fuel? Explain its types in detail. 08
- b) Explain flue gas analysis by using Orast apparatus. 07
- Q.10 Write short note (any three): 15
- Comparison of Otto, Diesel and Dual cycle on the basis of maximum pressure and temperature.
  - Brayton cycle
  - Pure substance
  - T-S Diagram

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-360**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mechanical)**  
**Thermodynamics-I**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- (i) Question no.1 & 6 are compulsory from section A & B
- (ii) Solve any two questions from the remaining from each section.
- (iii) Use of steam table & mollier diagram is permitted.
- (iv) Assume suitable data, if required.

**Section A**

- |     |   |          |
|-----|---|----------|
| Q.1 | Solve any Five  | 10       |
|     | <ol style="list-style-type: none"> <li>(i) Modify SFEE for isentropic nozzle</li> <li>(ii) Explain PMM-II</li> <li>(iii) State Kelvin-plank law</li> <li>(iv) Represent isentropic expansion on P-V. &amp; T-S. diagram.</li> <li>(v) List the limitations of First law of thermodynamics</li> <li>(vi) Write assumption for SFEE</li> <li>(vii) Explain flow work</li> </ol> |          |
| Q.2 | <ol style="list-style-type: none"> <li>(a) Prove the equivalence of Kelvin plank and clousius statements.</li> <li>(b) Steam at a 6.87 bar, 205°C enters a insulated nozzle with a velocity of 50 m/s &amp; leaves at 0.137 MPa and velocity of 500 m/s. Determine final enthalpy of steam.</li> </ol>  | 07<br>08 |
| Q.3 | <ol style="list-style-type: none"> <li>(a) Two Carnot engines work in series between the source and sink temperatures of 500K &amp; 300K if both engines develop seam power determine intermediate temp.</li> <li>(b) State &amp; prove Carnot theorem.</li> </ol>  | 08<br>07 |
| Q.4 | <ol style="list-style-type: none"> <li>(a) Explain Clausius inequality.</li> <li>(b) Prove that “entropy is property of system”.</li> </ol>   | 07<br>08 |
| Q.5 | Short notes on (Any three) <ol style="list-style-type: none"> <li>(i) Heat engine &amp; heat pump</li> <li>(ii) PMM-I &amp; PMM-II</li> <li>(iii) Various statements of second law of thermodynamics</li> <li>(iv) Temperature – Entropy diagram.</li> </ol>  | 15       |

## Section B

- Q.6 Solve any five 10
- (i) What is fuel
  - (ii) List Applications of steam
  - (iii) Write equation for minimum of air required per kg of fuel.
  - (iv) List methods used to determine dryness fraction of steam.
  - (v) Draw Dual Cycle on P-V. & T-S diagram.
  - (vi) Explain h-s diagram
  - (vii) Define critical & Tripple point.
- Q.7 (a) Derive the expression for ideal efficiency of Brayton cycle 07  
 (b) Derive the condition for maximum power output from engine working on Otto cycle. 08
- Q.8 (a) Explain flue gas analysis by using Orsat apparatus. 07  
 (b) Steam at 10 bar, 250°C determine 08
- (i) Quality of Steam
  - (ii) Sp-Volume
  - (iii) Specific enthalpy
  - (iv) Specific entropy
- Q.9 A volumetric analysis of coal gives C=80%, H<sub>2</sub>=15% & remaining incombustible calculate 15
- (i) Minimum air required.
  - (ii) Gravemetric analysis of products of combustion if 25% excess air is supplied.
- Q.10 Short note on (Any three) 15
- (i) Compare Otto, Diesel & Dual cycle for same compression ratio & same heat addition.
  - (ii) Diesel cycle
  - (iii) Separating calorimeter
  - (iv) Enthalpy-Entropy diagram.

Total No. of Printed Pages:3

**SUBJECT CODE NO: H-407**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Turbo Machines**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

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

**Section A**

- Q.1 a) Define a turbo machine with a neat sketch explain different parts of turbo machine. 06
- b) Distinguish between a turbo machine & positive displacement machine. 07
- Q.2 a) Show that a curve radial vane the work done per second is given by  $\rho av^2 [vw_1u_1 \pm vw_2u_2]$ , the notation carry usual meaning. 06
- b) A 8.5 cm diameter jet having a velocity of 33 m/s strikes a flat plate, the normal of which is inclined at  $45^\circ$  to the axis of the jet. Find the normal pressure on the plate, when. 07
- i) The plate is stationary
  - ii) When the plate is moving with a velocity of 18 m/s & away from the jet.
  - iii) Also determine the power & efficiency of the jet when the plate is moving.
- Q.3 a) A jet of water of diameter 75mm moving with a velocity of 30 m/s, strikes a curved fixed plate tangentially at one end at an angle of  $30^\circ$  to the horizontal. The jet leaves the plate at an angle of  $20^\circ$  to the horizontal. Find the force exerted by the jet on the plate in the horizontal & vertical direction. Also calculate resultant force per unit weight of water. 06
- b) A jet of water of 30mm diameter strikes a hinged square plate at its Centre with a velocity of 23m/s. The plate is deflected through an angle of  $20^\circ$ . Find the weight of plate. If the plate is not allowed to swing, what will be the force required at the lower edge of the plate to keep the plate in vertical position. If the height of the plate is 30cm. 07
- Q.4 a) Describe briefly the function of various main component of Kaplan turbine with neat sketch. 06
- b) What is the purpose of draft tube? Describe with neat sketches different types of draft tube. Also write efficiency equation of draft tube. 07



- Q.5 The three – jet pelton turbine is required to generate 10,000 KW under a net head of 420m. The blade angle at outlet is  $15^\circ$  and the reduction in the relative velocity while passing over the blade is 5%. If the overall efficiency of the wheel is 80%, coefficient of velocity is 0.98 & speed ratio is 0.46 then find: 14
- The diameter of jet
  - The total flow in  $m^3/s$
  - The force exerted by a jet on the buckets.
  - If the jet ratio is not to be less than 10, find the speed of the wheel for a frequency of 50 Hertz / sec & the corresponding wheel diameter.

### Section B

- Q.6 a) Define Manometric efficiency, and obtain an expression for the minimum starting speed of a centrifugal pump. 06
- b) A centrifugal pump having outer diameter equal to three times the inner diameter and running at 1200 rpm. Works against a total head of 75m. The velocity of flow through the impeller is constant & equal to 3.2 m/s. The vanes are set back at an angle of  $30^\circ$  at outlet. If the outlet diameter of the impeller is 600mm & width at outlet is 50mm. determine: 07
- Vane angle at inlet
  - Manometric efficiency
  - Least speed to start the pump
  - Pressure rise in the impeller of a centrifugal pump.
- Q.7 a) Why governing of steam turbine necessary? Describe with neat sketch the throttle governing of steam turbine. 07
- b) Draw a schematic diagram of a gas turbine plant employed with reheating. Also represent cycle on P-V & T –S diagram & mentioned the assumptions made. 06
- Q.8 A single row impulse turbine develops 132.4 KW at a blade speed of 175 m/s using 2kg of steam per sec. steam leaves the nozzle at 400 m/s. steam leaves the turbine blade axially. Velocity coefficient of blade is 0.90. 13
- Find
- Maximum blade efficiency
  - Tangential force on blade
  - Energy converted to heat by blade friction.
  - Developed axial thrust.

Q.9 In a gas turbine the compressor takes in air at a temperature of  $15^{\circ}\text{C}$  & compresses it to four times the initial pressure with an isentropic efficiency of 82%. The air is then passed through a heat exchanger heated by the turbine exhaust before reaching the combustion chamber. In the heat exchanger 78% of the available heat is given to the air. The maximum temp after constant pressure combustion is  $600^{\circ}\text{C}$  & efficiency of the turbine 70%. Neglecting all losses.

Find:

- i) Work developed by system
- ii) Thermal efficiency
- iii) Work ratio.

$$r = 1.4, \text{CPa} = \text{CPg} = 1 \text{ KJ/Kg} \cdot \text{K}$$

Q.10 Write short notes on any three of followings.

- i) Stirling cycle
- ii) Net Positive Suction Head (NPSH)
- iii) Energy losses in steam turbine
- iv) Velocity compounding of steam turbine
- v) Closed cycle gas turbine

Total No. of Printed Pages:2

**SUBJECT CODE NO: H-450**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Elective-I: Energy Conservation and Management**  
**(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.**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | A. Explain classification of energy available on earth.                                | 04 |
|     | B. Explain Indian energy conservation act & its features.                              | 06 |
|     | C. Explain global primary energy resources.  | 03 |
| Q.2 | A. What are the methods of heat recovery in a furnace?                                 | 04 |
|     | B. What are the methods available for assessing boiler efficiency & explain briefly.   | 06 |
|     | C. Explain difference between economizer and air preheater.                            | 03 |
| Q.3 | A. Explain Steam trap.   | 03 |
|     | B. Explain briefly various energy conservation opportunities in a Refrigeration plant. | 06 |
|     | C. Explain CHP using steam turbine.  | 04 |
| Q.4 | A. Explain Kyoto protocol in India.  | 03 |
|     | B. What are waste heat recovery boilers? Explain their need & benefits.                | 06 |
|     | C. Explain various types of fans.  | 04 |
| Q.5 | Write short note <u>any two</u>  | 14 |
|     | A. UNFCC   |    |
|     | B. Energy pricing  |    |
|     | C. Steam distribution system   |    |
|     | D. GDP   |    |

**Section B**

- |     |  |    |
|-----|--|----|
| Q.6 | A. What is DSM? Draw neat block diagram & explain it.                            | 06 |
|     | B. What is variable speed drive? Which drive is to be used for I.M.?             | 04 |
|     | C. How power factor effect the load side system?                                 | 03 |
| Q.7 | A. What do you understand by Energy performance contract? Explain role of ESCOS. | 06 |
|     | B. Differentiate between Net present value & Internal rate of return.            | 03 |
|     | C. What is procedure to calculate return of investment?                          | 04 |
| Q.8 | A. What are risk and sensitivity analysis in terms of Energy audit?              | 06 |
|     | B. What do you mean by cash flow?  | 04 |
|     | C. Explain the significance of Sankey diagram.                                   | 03 |

- Q.9           A. What is IRR? What significance it have in financial management.           04  
              B. Enlist different financial analysis technique and explain it.           06  
              C. Explain Life cycle cost.           03
- Q.10       Write a short note (Any two)           14  
              A. Energy Audit Instrument  
              B. Pay-back period  
              C. Net present value  
              D. Time of day tariff

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-456**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Civil/Mech./EE/ECT)**  
**Elective-I: SAP Material Management - I**  
**(REVISED)**

[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 is compulsory.
  - 2) From remaining questions in Section A & B student are supposed to solve any two questions from each section.
  - 3) Assume suitable data wherever necessary.
  - 4) Draw neat sketches wherever necessary.

**Section A**

- Q.1 Write a short note on(Any Two) 10
- a) Management accounting & corporate governance.
  - b) Life cycle management.
  - c) Sales order management.
- Q.2 07
- a) Explain the procurement of consumable material.
  - b) What are valued & non-valued receipts? 08
- Q.3 07
- a) Explain standard report in service.
  - b) Explain drafting of material requisition planning. 08
- Q.4 07
- a) Explain system wide concept.
  - b) Explain procurement of stock material. 08
- Q.5 07
- a) Explain the importance of batch record.
  - b) Explain how you can link a document to a vendor master record? 08

**Section B**

- Q.6 Write a short note on(Any Two) 10
- a) Basics of price determination.
  - b) Explore source determination with quota.
  - c) Extracting purchase information.
- Q.7 07
- a) Define function authorization for buyers & explain it in detail.
  - b) What is invoicing plan? 08
- Q.8 07
- a) How to post invoice? Explain procedure.
  - b) How to create invoice entry by applying taxes, cash discount & foreign currency. 08

- Q.9
  - a) How to create purchase order with reference of source determination. 07
  - b) Explain how to enter the invoice without reference to purchase order. 08
  
- Q.10
  - a) What are the steps involved in consignment cycle. 07
  - b) What is the difference between stock transfer between two plants belonging to same company 08  
code & those belonging to different company code?

Total No. of Printed Pages:03

**SUBJECT CODE NO:- H-419**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECH/PROD)**  
**Design of Machine Elements-I**  
**(OLD)**

[Time: Three Hours]

[Max. Marks:80]

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

- N.B
- i) solve any three questions from each section.
  - ii) Figure to the right indicate full marks.
  - iii) Assume suitable data if required and state it clearly.

**Section A**

- Q.1 a) Explain in detail classification of machine design. 07
- b) Define the following terms: 06
- i) Stress ii) Elasticity iii) Factor of safety.
- Q.2 a) What is shaft? Derive the torsion equation for shaft subjected to twisting moment only. 04
- b) A mid steel bracket as shown in figure 1 is subjected to pull of 4500N acting at 45° to horizontal axis. The bracket has rectangular section whose depth is twice the thickness. Find the cross-sectional dimensions of bracket if the permissible stress in material of bracket is limited to 46 MPa. 09

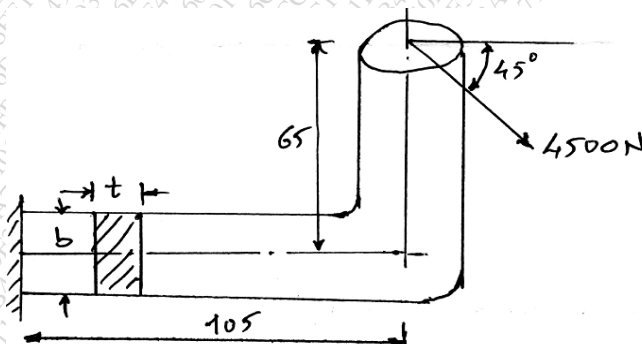


Figure 1.

- Q.3 Draw a neat sketch and explain in detail design procedure of rigid flange coupling 13

- Q.4 Design a cast iron protective type flange coupling to transmit 18Kw at 1000rpm from an electric motor to a compressor . The service factor may be assumed as 1.25, Following permissible stresses may be used. 13
- Shear stress for shaft , bolts and key=40Mpa  
Crushing stress for bolts and key=80Mpa.  
Shear stress for cast iron flange=8Mpa.
- Q.5 Write a short note on. 14
- Ergonomic consideration in design
  - Write the designation of the following
    - 25C8
    - Fe330
    - X20Cr18Ni2
    - XT110Mo10Co8
  - Bolts of uniform strength.

### Section B

- Q.6 a) What is stress concentration? What are different methods available to reduce them? 05
- b) A loaded narrow gauge rail car weighting 2300Kg and moving at 1.4 m/s velocity is brought to rest by a bumper consist of two helical compression springs of spring index 6. In bringing rail car to rest both the bumper spring gets compressed by 155mm, spring steel has permissible shear stress of  $420 \text{ N/mm}^2$  and  $G=84 \times 10^3 \text{ N/mm}^2$  08
- Determine diameter of spring wire
  - Mean coil diameter
  - Number of turns of spring coil.
- Q.7 A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4P. The span of Beam is 500mm and its cross section is circular with a diameter of 60mm. taking for the Beam material an ultimate stress of 710Mpa, Yield stress of 510 Mpa. Endurance limit of 320 Mpa for reserve bending and a factor of safety as 1.4 . Calculate the maximum value of P by using Soderberg and Goodman equation. Take a size of 0.85, surface finish factor 0.9 13



Q.8 A bracket as shown in figure 2 is to carry a load of 60KN . Determine the size of the rivet if the shear stress is not to exceed 50Mpa. Assume all rivets of the same size. 13

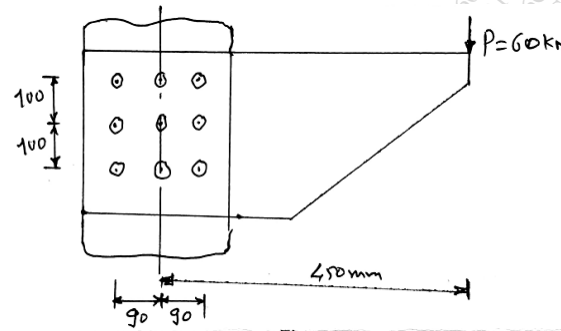


Figure 2.

Q.9 a) Derive the soderberg equation for the combination of stresses 06

b) What are the different failures of riveted joint 07

Q.10 Write a short note on following 14

- i) Low cycle and high cycle fatigue
- ii) Nipping of leaf spring
- iii) Effect of size factor, surface finish factor on endurance limit.

Total No. of Printed Pages:2

**SUBJECT CODE NO: H-338**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Automatic Control System**  
**(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) Draw neat sketches if required.
- 3) Assume suitable data, if necessary.

**Section A**

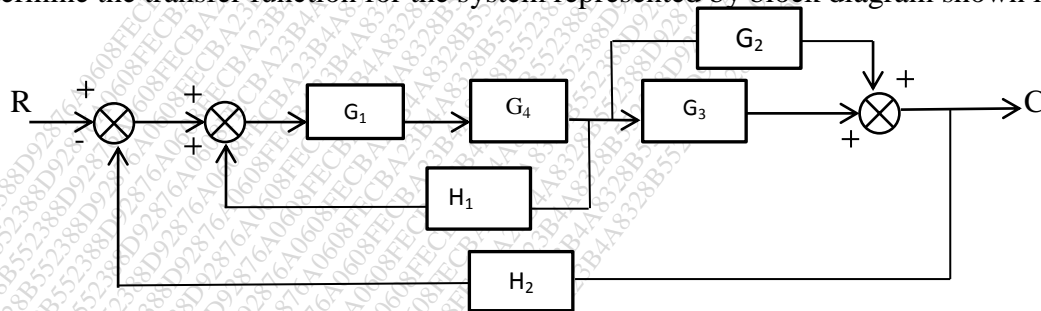
Q.1 a) What is Control system? Differentiate between Open Loop Control system and closed Loop control system. 07

b) Define Transfer function of control system. What is its importance? 06

Q.2 a) Explain in detail Force voltage analogy. 07

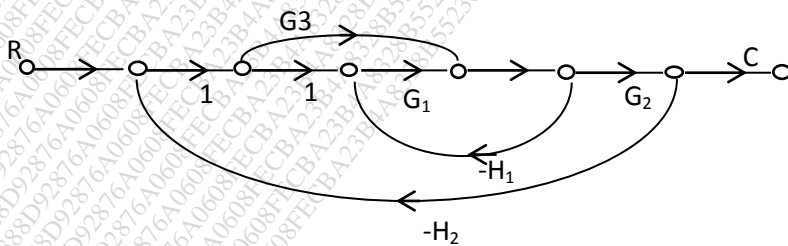
b) Write a short note on Thermal system. 06

Q.3 a) Determine the transfer function for the system represented by block diagram shown in fig. 07



b) Differentiate between Block Diagram and SFG. 06

Q.4 a) Determine the transfer function of the system in fig. 07



b) Explain Proportional Control action with an example. 06

- Q.5 Write short notes on.(Any Two) 14
- a) P.I.D controller.
  - b) Stepper motor.
  - c) Hydraulic controllers.

**Section B**

- Q.6 a) Explain time constant in detail. 06  
 b) Derive the equation for unit ramp response of first order system. 07

- Q.7 a) Give the T.F.,  $G(S)=\frac{50}{s^2+8s+50}$ . Determine Peak time, % overshoot  $T_S$  and  $T_r$ . 07  
 b) Explain time domain specifications. 06

- Q.8 a) Write a short note on concept of stability. 06  
 b) Determine the stability for  $4s^4+10s^3+10s^2+4s+2$ . 07

- Q.9 a) For the unity feedback control system  $G(S)=\frac{10}{s(s+1)(s+3)}$ . Sketch the bode plot & determine the gain and phase margin. 09  
 b) Write down the advantages of frequency domain analysis. 04

- Q.10 a) Draw the Root Locus for the following system  $G(S).H(S)=\frac{K}{s(s+7)(s+9)}$ . 10  
 b) Write a short note on Root Locus. 04

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-455**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Elective-I: Non Conventional Energy System**  
**(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 if required and state it clearly.

**Section A**

- |     |   |    |
|-----|---|----|
| Q.1 | a) What is the importance of energy sources? Describe Indian energy scenario. | 06 |
|     | b) Compare conventional & non-conventional energy sources.                    | 07 |
| Q.2 | a) How average solar radiation can be estimated?                              | 06 |
|     | b) Discuss solar radiation on tilted surfaces.                                | 07 |
| Q.3 | Describe the following Solar energy storage systems:                          | 13 |
|     | a) Thermal storage.   |    |
|     | b) Electrical storage.  |    |
|     | c) Chemical storage.  |    |
| Q.4 | a) Describe solar pond electric power plant with cooling tower.               | 07 |
|     | b) With the help of neat sketch explain any two solar green houses.           | 06 |
| Q.5 | Write short note on the following.  | 14 |
|     | a) Design principle & constructional details of a box type solar cooker.      |    |
|     | b) Solar pumping.   |    |

**Section B**

- |     |   |    |
|-----|---|----|
| Q.6 | a) Describe forces on the blades and thrust on turbines (wind).   | 07 |
|     | b) Explain horizontal axial wind turbine. (Wind aero generators).   | 06 |
| Q.7 | What are the basic components of wind energy conversion system? Explain in detail.                                      | 13 |
| Q.8 | a) Discuss the component of wind electric system.   | 04 |
|     | b) With schematic diagram explain single process conventional digester and two stage digestion process in biogas plant. | 09 |

- Q.9 a) What are the advantages and disadvantages of geothermal energy forms? 06
- b) Describe various geothermal resources. 07
  
- Q.10 a) Describe open cycle OTEC system. 07
- b) Write a short note on principle of Tidal power generation. 07

Total No. of Printed Pages:2

**SUBJECT CODE NO: H-373**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Metrology and Quality Control**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- 1) Attempt three questions from each section.
  - 2) Figures to the right indicates full marks.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) Differentiate between linear and angular measurements with examples.  | 07 |
|     | b) Define the following terms<br>1. Metrology<br>2. Accuracy<br>3. Precision<br>4. Measurement error<br>5. Calibration<br>6. Slip gauge                      | 06 |
| Q.2 | a) Enlist the different types of comparators used for various measurements and explain in detail construction and working of electrical types of comparator. | 07 |
|     | b) Explain construction and working of angle décor with neat sketch.   | 06 |
| Q.3 | a) What is surface texture? Explain working of stylus probe type surface texture measuring instrument with neat sketch.                                      | 07 |
|     | b) Enlist and explain the different types of gauges used with the help of neat diagram.  | 06 |
| Q.4 | a) What is gear metrology? Explain gear tooth vernier with neat sketch.  | 07 |
|     | b) Differentiate between coordinate measuring machine (CMM) and universal measuring machine (UMM).   | 06 |
| Q.5 | Write short notes on: ( <u>Any three</u> )   | 14 |
|     | a) Autocollimator  |    |
|     | b) Need, importance of calibration   |    |
|     | c) Types of fits   |    |
|     | d) Profile projector   |    |

Section B

- Q.6 a) Explain the use of control chart for variable and attributes. 07  
 b) Explain 5S and what are its benefits? 06
- Q.7 a) Explain the QFD with the help of suitable example. 07  
 b) Explain quality of design and quality of performance. 06
- Q.8 a) Explain the Kanban system of production control. 07  
 b) Explain the characteristics of OC curve. 06
- Q.9 a) What is quality circle? Explain in details. 07  
 b) Explain the process capability. 06
- Q.10 Write short notes on: (Any three) 14  
 a) Value engineering  
 b) Sampling methods  
 c) Just In Time  
 d) ISO 9000 standards

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-393**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Production Processes-I**  
**(OLD)**

[Time: Three Hours]

[Max.Marks: 80]

- N.B Please check whether you have got the right question paper.
- 1) Question No.1 from Section A and Q. No.6 from Section B are compulsory.
  - 2) Attempt any two questions from Q. No.2 to Q. No.5 in Section A and any two Questions from Q. No.7 to Q. No.10 in section B.
  - 3) Figures to the right indicate full marks.
  - 4) Assume suitable data whenever necessary.

**Section A**

- |     |   |          |
|-----|---|----------|
| Q.1 | Attempt any five questions from the following:-   | 10       |
|     | <ol style="list-style-type: none"> <li>(a) State the different types of cores</li> <li>(b) What is cope, drag and cheek in sand molding?</li> <li>(c) State the important parameters for design of Cupola</li> <li>(d) Define stop-off pieces in foundry.</li> <li>(e) What is rotary swaging?</li> <li>(f) State the defects in forging.</li> <li>(g) What are the different hot working processes?</li> <li>(h) Define Punch and Die.</li> <li>(i) Explain perforating and cutting off</li> <li>(j) What is the function of Pitman in Power press?</li> </ol> |          |
| Q.2 | <ol style="list-style-type: none"> <li>(a) What are the different types of patterns used in molding? Explain each of them by neat sketch</li> <li>(b) Explain defect in casting.</li> </ol>   | 08<br>07 |
| Q.3 | <ol style="list-style-type: none"> <li>(a) Explain cold chamber die casting</li> <li>(b) What is Pit Furnace?</li> </ol>  | 08<br>07 |
| Q.4 | <ol style="list-style-type: none"> <li>(a) How bolt is manufactured? Explain with neat sketch.</li> <li>(b) Explain coining. Differentiate between hot working and cold working process.</li> </ol>   | 08<br>07 |
| Q.5 | <ol style="list-style-type: none"> <li>(a) What is roll bending. Give its advantages and limitations.</li> <li>(b) Explain the following sheet metal processes               <ol style="list-style-type: none"> <li>(i) Blanking</li> <li>(ii) Punching</li> <li>(iii) Slitting</li> <li>(iv) Lancing</li> </ol> </li> </ol>  | 07<br>08 |



Section B

Q.6	Solve any five	10
	a) What is the classification of Plastics?	
	b) Explain Laminating Plastics.	
	c) Enlist plastic Moulding Dies.	
	d) What is the need of surface treatment?	
	e) What is Anodizing?	
	f) Why cylinders are kept in upright position in gas welding?	
	g) What is the role of flux in welding?	
	h) What are shielding gases? Give tis functions.	
	i) What is the need of testing of welds?	
	j) Enlist safety equipments for welding.	
Q.7	(a) What is Rotational Moulding?	08
	(b) What is Blow Moulding? Give its applications.	07
Q.8	(a) Explain Electroslag Welding process with its applications.	08
	(b) With neat sketch explain shielded metal arc welding process.	07
Q.9	(a) Explain Resistance Spot Welding with its advantages and limitations.	08
	(b) With neat sketch explain LASER beam welding. Give its applications.	07
Q.10	(a) What are the types of coatings? Explain any one	08
	(b) How mechanical cleaning for metals are done?	07

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-394**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mechanical)**  
**Production Processes**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B Solve any THREE from questions 1 to 5 &amp; 6 to 10

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | (a) What is selection criteria for pattern? State pattern making materials?  | 07 |
|     | (b) Explain steps involved in preparation of moulding sand.                  | 06 |
| Q.2 | (a) Describe Investment casting with neat sketch.                            | 07 |
|     | (b) How sand testing methods are used?                                       | 07 |
| Q.3 | (a) Brief about pattern allowances   | 06 |
|     | (b) What is hot working of metals? Brief about forging.                      | 07 |
| Q.4 | (a) Explain closed Die & Open Die forging.                                   | 06 |
|     | (b) What is extrusion? What types of extrusion processes are possible & how? | 07 |
| Q.5 | Write a note on  |    |
|     | (i) Power presses in sheet metals.   | 04 |
|     | (ii) Dies used in sheet metals.  | 05 |
|     | (iii) Hemming & Flanging.  | 04 |

**Section B**

- |     |   |    |
|-----|---|----|
| Q.6 | (a) Give Broad classification of joining processes and explain Gas welding. | 07 |
|     | (b) Describe about plasma Arc Welding.                                      | 06 |
| Q.7 | (a) Why Electron Beam Welding is required & how to process it.              | 07 |
|     | (b) How & Why resistance welding is used?                                   | 07 |
| Q.8 | (a) What are different welding defect & How welds can be tested.            | 07 |
|     | (b) Describe submerged Arc Welding.   | 06 |
| Q.9 | (a) How Blow moulding is used for making bottles.                           | 07 |
|     | (b) What is compression moulding? Explain with neat sketch.                 | 06 |

Q.10

Write short note on

- (a) Anodizing
- (b) Galvanizing
- (c) Electroplating

04

04

05

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-384**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**Industrial Management & Engineering Economics**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Attempt any three from each section.
- ii) Figures to the right Indicates full marks.
- iii) Assume suitable data, if necessary and state them clearly

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) 'Management is getting things done through people.' Comment             | 07 |
|     | b) Define Six Sigma and explain its methodology?                           | 06 |
| Q.2 | a) Enlist the various functions of managements? Explain any one detail?    | 07 |
|     | b) Differentiate between Data, Information, Knowledge and Wisdom?          | 06 |
| Q.3 | a) Explain project organization with its advantages and disadvantages?     | 07 |
|     | b) Explain the advantages and disadvantages of Public Sector organisation? | 06 |
| Q.4 | a) Explain the role of personnel manager in organization?                  | 07 |
|     | b) Explain functions of Trade Union.                                       | 06 |
| Q.5 | Write short notes on any three:-   |    |
|     | a) Steps in implementing TQM   | 05 |
|     | b) Management by Objectives  | 05 |
|     | c) Staff organisation  | 04 |
|     | d) Entrepreneurship development schemes                                    | 04 |
|     | e) Job description   | 04 |

**Section B**

- Q.6 a) Discuss the economic principles for management decisions? 07  
 b) What are the various factors responsible for fluctuation in demand? 06
- Q.7 a) Explain various components of inventory and its effect on total cost of inventory? 07  
 b) Annual demand for x item is 12000 units. Cost per unit is Rs.100/-. The supplier has agreed to provide discount of 6%, if order exceeds 250 units. Cost of holding inventory is 20% of cost of material per unit per year. Cost of ordering is Rs.50/- per order. Find E.O.Q. and total inventory carrying cost? 06
- Q.8 a) A CNC machine costs Rs.20, 000, 000/- and is estimated to serve for 8 years after which its salvage value is estimated to be Rs.1,80,000/-. Find depreciation fund at the end of the 4<sup>th</sup> year by straight-line method? 07  
 b) What is the scope and significance of finance manager? 06
- Q.9 a) Explain Rate of Return Method and Annual Cost Method of Replacement analysis? 07  
 b) Explain elements of costs? 06
- Q.10 Write short notes on any three:-  
 a) ABC Analysis. 05  
 b) Equilibrium of demand and supply. 05  
 c) Profitability index & IIR method. 04  
 d) Reasons of depreciation. 04

Total No. of Printed Pages:3

**SUBJECT CODE NO:- H-429**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mechanical)**  
**Strength of Material**  
**(REVISED)**

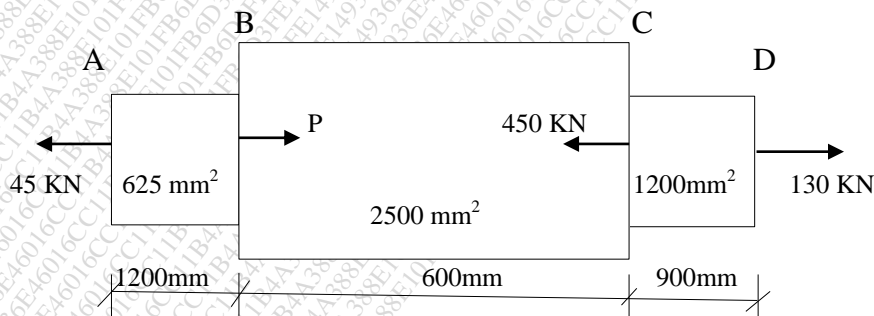
[Time: Three Hours]

[Max.Marks:80]

- N.B
- Please check whether you have got the right question paper.
- i) Question No.1 & 6 are compulsory attempt any two from remaining each section.
  - ii) Figures to right indicate full marks.
  - iii) Assume suitable data if necessary.

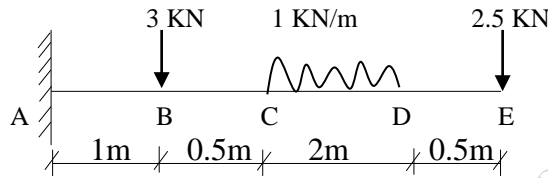
**Section A**

- Q.1 Attempt any Five 10
- a) Define elasticity.
  - b) Define yielding.
  - c) State the relation between Bulk modulus and Young's modulus.
  - d) Define shear Force and bending moment
  - e) Define bending stresses.
  - f) Explain zero shear Force point
  - g) What is modulus of section for hollow rectangular and Hollow circular section?
  - h) Explain Poisson's Ratio.
- Q.2 a. A member ABCD is subjected to a point load as shown in fig. Find force P necessary for equilibrium. Determine total elongation. 08  
 Take  $E=2.1 \times 10^5 \text{ N/mm}^2$ .

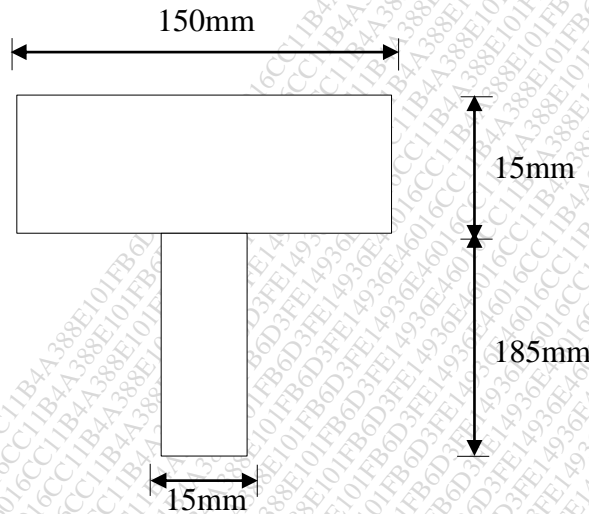


- b. A steel rod 20mm in diameter and 1m long is heated through  $100^\circ\text{C}$  and at the same time subjected to a pull P. If the total extension of the rod is 2.5 mm, What should be the magnitude of P? Take  $E=200 \times 10^3 \text{ N/mm}^2$   
 $\alpha = 12 \times 10^{-6}/^\circ\text{C}$ .

Q.3 Draw SFD & BMD for simply supported beam shown in figure. 15



Q.4 Calculate the maximum tensile and compressive bending stresses for T section shown in figure 15



T section carries a UDL of 30 kN/m, over the entire span of 6m.

Q.5 a) The shear force acting on a section of beam is 50 kN. The section of the beam is of T-shaped having flange 100mm x 20mm and web 20mm x 100mm. Draw shear stress distribution diagram and find maximum shear stress. 08

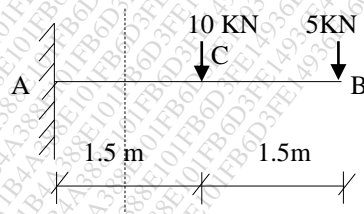
b) Derive the relation  $E=3K(1-2\mu)$ . 07

**Section B**

Q.6 Attempt any Five 10

- a) Define polar moment of inertia
- b) Define Strain Energy
- c) Define modulus of resilience
- d) What is the limit of eccentricity for rectangular section.
- e) Define Hoop Stress
- f) Define moment by double integration method.
- g) What is mohr circle?
- h) State Strain Energy Stored in body, when load is gradually applied.

- Q.7 a) A Hollow tube 3m long, 60mm outside diameter is required to transmit 50 KW 08  
 at 3 R.p.s. The maximum stress is  $50 \text{ N/mm}^2$ .  
 Find, (1) Inside diameter  
 (2) Angle of twist,  
 $G=85 \times 10^3 \text{ N/mm}^2$ .
- b) A 28mm diameter rod is 2.4m long and suspended in vertical position with collar 07  
 at lower end . If body freely sliding 800N on the collar through a height of 65mm  
 Find.  
 (i) Maximum Value of Instantaneous stress.  
 (ii) Maximum instantaneous elongation.  
 (iii) Static force to induce. Same maximum stress  
 Take  $E=2 \times 10^5 \text{ N/mm}^2$
- Q.8 a) A boiler is subjected to an internal steam pressure of  $2\text{N/mm}^2$ . The thickness of boiler 08  
 plate is 2 cm and permissible tensile stress is  $120\text{N/mm}^2$ . Find out the maximum  
 diameter, when efficiency of longitudinal joint is 90% and that of circumferential joints  
 is 40%.
- b) A hollow circular column having external and internal diameters of 300mm and 250mm 07  
 respectively carries a vertical load of 100 KN at the outer edge of the column. Calculate  
 the maximum intensities of stress in section.
- Q.9 At a point in a strained material, the principal stresses are  $100\text{N/mm}^2$  (tensile) and  $40 \text{ N/mm}^2$  15  
 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at  $60^\circ$   
 to the axis of the major principal stress. What is the maximum Intensities of shear stress in material  
 at the point?
- Q.10 A cantilever beam AB supports two point loads of 10 KN and 5 KN as shown in fig. Calculate the 15  
 deflections at points B and C. Take  $E=200 \text{ GPa}$  and  $I=20 \times 10^6 \text{ mm}^4$ .





Total No. of Printed Pages:3

**SUBJECT CODE NO:- H-428**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Strength of Material**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

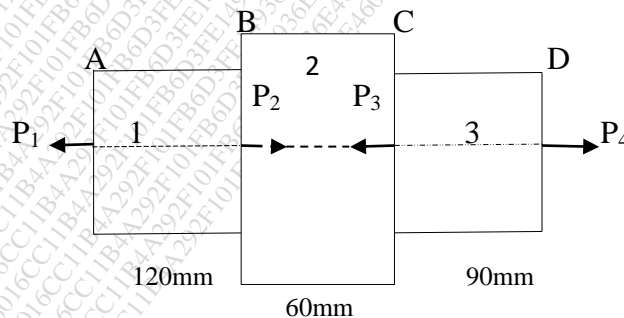
N.B

Please check whether you have got the right question paper.

- 1) Q.No.1 & Q. No.6 are compulsory.
- 2) Attempt any two questions from the remaining questions in each section.
- 3) Assume suitable data, if necessary.

**Section A**

- Q.1 Attempt any five 10
1. Define Strain
  2. Define Tensile Stress.
  3. Define Bending Moment & Shear Force
  4. Define modulus of Elasticity.
  5. Define Poisson's Ratio
  6. Define Neutral Axis
  7. Define Lateral Strain
  8. Define Factor of Safety
- Q.2 a) A member ABCD is subjected to point loads  $P_1$ ,  $P_2$ ,  $P_3$ ,  $P_4$ . Calculate  $P_2$  for equilibrium if 07  
 $P_1 = 45$  KN,  $P_3 = 450$  KN,  $P_4 = 130$  KN. Determine Total Elongation of the member,  
 Assuming  
 $E = 2.1 \times 10^5$  MPa.



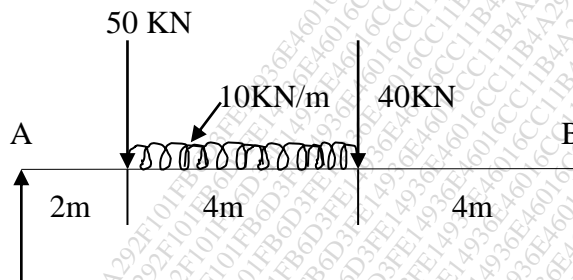
$$A_1 = 625 \text{ mm}^2$$

$$A_2 = 2500 \text{ mm}^2$$

$$A_3 = 1250 \text{ mm}^2$$

- b) A Steel Rod 30mm diameter and 5m Long is connected to Two grips and Rod is maintained 08  
at temperature of 100°C. Determine the stress and pull exerted when temperature falls to  
30°C, If (a) Ends do not yield.  
(b) Ends yields at 0.12mm.  
 $E=2.1 \times 10^5 \text{ MPa}$   $\alpha= 12 \times 10^{-6}/^\circ\text{C}$

- Q.3 a) Explain shear Force & Bending moment Diagrams. 03  
b) A simple supported Beam of 10m Length carries U.D.L & Two point loads as shown in 12  
diagram. Draw S.F & B.M Diagrams for the Beam, Calculate maximum Bending moment



- Q.4 a) A Timber Beam of Rectangular Section is to support a load of 20 kN uniformly distributed 08  
over a span of 3.6m when Beam is simply supported. If the depth of section is to be twice  
the breadth & Stress should not exceed 7 MPa, find dimensions of the cross Section.  
b) Derive shear stress equation for the beam. 07

- Q.5 a) A copper tube 40mm diameter & 4mm thick is heated on steel rod 40mm Diameter. Find 08  
stress induced in each metal due to temperature rise 70°C. Take  $E_s=2.1 \times 10^5 \text{ MPa}$  .  
 $E_{cu}=160 \times 10^3 \text{ MPa}$   $\alpha_s= 11 \times 10^{-6}/^\circ\text{C}$   $\alpha_c=16 \times 10^{-6}/^\circ\text{C}$ .  
b) Derive with usual notations that shear stress at a layer in the section of Beam is 07  
Given by  $= \frac{SAY}{IB}$ .

**Section B**

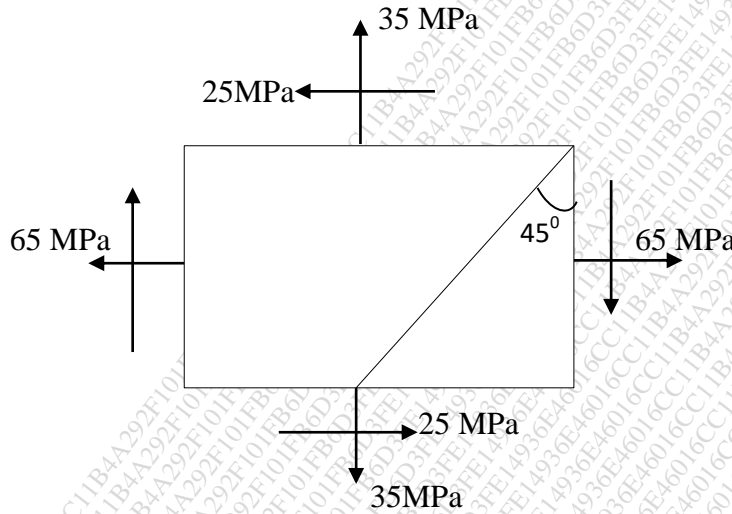
- Q.6 Attempt any five 10  
1) Define major principal stress.  
2) What is Mohr's Stress circle.  
3) Define Strain Energy.  
4) Define Slope & Deflection of Beam.  
5) Define Hoop Stress & Longitudinal stress.  
6) Define Proof Resilience  
7) Write Torsional Formulae.

- Q.7 (a) Derive the equation for Hoop Stress for Hollow cylinder. 08

- (b) A cylindrical thin Drum 80 cm in diameter and 3m long has a shell of thickness of 1 cm. If the drum is subjected to an internal pressure of 2.5 Mpa; Determine change in diameter, change in length. 07

$E = 2 \times 10^5 \text{ MPa}$     $\mu = 0.3$

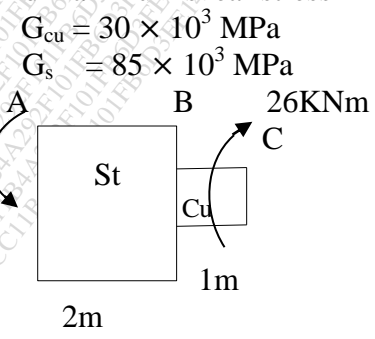
- Q.8 a) A point in a strained material is subjected to stresses as shown in diagram. Using Mohr's circle method, Determine the normal & Tangential stresses Across oblique plane. 08



- b) The principal stresses at a point in a material are  $120 \text{ N/mm}^2$  Tension &  $90 \text{ N/mm}^2$  compression, Find analytically the normal & shear stresses on a plane inclined  $30^\circ$  to plane of greater principal stress. 07

- Q.9 a) Derive Macaulay's method for finding Deflection. 05  
 b) A Beam 4m long, simply supported at its ends carries load 'W' at the center. If the slope at the ends of beam is not to exceed  $1^\circ$ , Find Deflection at the center of the Beam. 10

- Q.10 a) A compound shaft is composed of 1 m length of solid copper 160mm in diameter to a 2m length solid steel shaft 200mm diameter. A torque of 26 KNm is applied at the end of shaft in opposite direction. Find maximum shear stress in each material & Total angle twist of the entire shaft 08



- b) A solid shaft circular cross section of 120mm Diameter is required to transmit 100 KW at 140 rpm. Determine the magnitude of shear stress produced in shaft 07

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-454**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Elective-I: Modern Management Techniques**  
**(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) Figure to the right indicates full marks.

**Section A**

- Q.1 a) Explain various types of scatter diagram along with illustrative example and their interpretation. 07  
 b) What is an interrelationship diagram? Give one example. What is its relationship with Ishikawa 06  
 diagram?
- Q.2 a) Explain evolution of six sigma approach. 07  
 b) What is six sigma environment and role of various team members? 06
- Q.3 a) What is five why process analysis? Explain with example. 07  
 b) What do you mean by BPR? Explain need of BPR? 06
- Q.4 a) What is poke-yoke? Give its purpose. 07  
 b) What are the basic elements of JIT system? 06
- Q.5 Write short note on(Any Two) 14  
 a) Cause and effect diagram.  
 b) Various steps of SMED process.  
 c) Types of waste in factory.

**Section B**

- Q.6 a) What do you mean by value analysis and value engineering? How are they related to 07  
 continuous improvement?  
 b) Explain the steps involved in TPM implementation. 06
- Q.7 a) What is quality function deployment? Give merits and demerits of it? 07  
 b) What is FAST analysis? Explain. 06
- Q.8 a) Explain the concept of lateral thinking. 07  
 b) Design QWL. Explain managerial role for improving QWL? 06

- Q.9 a) Explain the relationship between quality of work life and work life balance. 07
- b) Explain how interaction and relationship between customer requirement and product requirements are evaluated in house of quality. 06

- Q.10 Write note on following(Any Two): 14
- a) Competitor evaluation in house of quality.
  - b) Creativity and innovation.
  - c) Six thinking hats.

Total No. of Printed Pages:2

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

**Section A**

- |     |   |    |
|-----|---|----|
| Q.1 | a) Explain the concept of metal matrix composites.              | 06 |
|     | b) Elaborate unidirectional and discontinuous fiber composites. | 07 |
| Q.2 | a) Explain laminar and filled composites.                       | 07 |
|     | b) Define the following   | 06 |
|     | i. Ceramic matrix materials                                     |    |
|     | ii. Carbon materials  |    |
| Q.3 | a) Explain the processing of refractory & electronic ceramics.  | 06 |
|     | b) What are the various mechanical characteristics of polymers? | 07 |
| Q.4 | Give classification and properties of the following:            | 13 |
|     | i. Magnetic materials   |    |
|     | ii. Super alloys  |    |
|     | iii. Dielectric materials                                       |    |
| Q.5 | Write short notes on the following. (Any Two)                   | 14 |
|     | a) Smart materials  |    |
|     | b) Hybrid composites  |    |
|     | c) Thermoplastics & thermosets                                  |    |

**Section B**

- |     |   |    |
|-----|---|----|
| Q.6 | a) Explain sheet molding casting process.   | 07 |
|     | b) Discuss the design process for plaster mould casting.                                | 06 |
| Q.7 | a) How quality of castings can be ensured in casting process for plastics?              | 07 |
|     | b) Explain principle & applications of electroless coating.                             | 06 |
| Q.8 | a) Explain principle & process of chemical vapour deposition for cutting tool material. | 07 |
|     | b) What is process for thermal spray coating? Explain.                                  | 06 |

Q.9 With neat sketch describe the following:

- a) Wire EDM
- b) Water jet machining

13

Q.10 Write short note on the following: (Any Two)

- a) Principle & elements of rapid prototyping
- b) Electrochemical machining
- c) Chemical machining

14

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-452**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Elective-I: Production Planning and Control**  
**(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 if required & state it clearly.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) Define the term:<br><ol style="list-style-type: none"> <li>i. Production.</li> <li>ii. Planning.</li> <li>iii. Control.</li> </ol> Explain how they are related with each other.                            | 09 |
|     | b) What is the batch production system?  | 04 |
| Q.2 | a) Describe the function of production planning and control in brief.  | 07 |
|     | b) State the objective of:<br><ol style="list-style-type: none"> <li>i) Short term forecasting.</li> <li>ii) Long term forecasting.</li> </ol>   | 06 |
| Q.3 | Describe the following methods of forecasting:<br><ol style="list-style-type: none"> <li>i) Moving average method.</li> <li>ii) Survey of buyer's intention method.</li> </ol>                                 | 13 |
| Q.4 | a) Explain the working of MRP system. Describe the outputs of MRP system.  | 09 |
|     | b) Define inventory. What is economic order quantity?  | 04 |
| Q.5 | With the help of neat diagram explain the following terms:<br><ol style="list-style-type: none"> <li>a) Order quantity.</li> <li>b) Lead time.</li> <li>c) Safety stock.</li> <li>d) Reorder point.</li> </ol> | 14 |

**Section B**

- |     |  |    |
|-----|--|----|
| Q.6 | a) Discuss economic lot size when shortages are allowed.                                   | 06 |
|     | b) Explain how routing differs in job order, intermittent & continuous production systems. | 07 |
| Q.7 | a) Explain the role of bill of material.   | 06 |
|     | b) Describe the follow up or control phase of PPC.   | 07 |



- Q.8 a) Define the objective of line of balance.(LOB) 06  
b) Enlist the techniques for scheduling. Explain any one in detail. 07
- Q.9 a) State the benefits and demerits of JIT production system. 07  
b) What are the various types of waste? Explain. 06
- Q.10 Write short notes on the following. 14
  - a) Aggregate planning.
  - b) Lean production system.

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-451**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Elective-I: Power Plant Engineering**  
**(REVISED)**

[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.1 and Q.6 are compulsory.
- 4) Assume suitable data, if necessary.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) Explain in detail effect of variable loading on a power plant.              | 06 |
|     | b) Explain coordination of power from different sources.                       | 06 |
| Q.2 | a) Explain in detail dry system and wet system of ash disposal.                | 07 |
|     | b) Explain the factors considered for site selection of a thermal power plant. | 07 |
| Q.3 | a) Explain in detail types of engines used in diesel power plant.              | 07 |
|     | b) Explain in detail layout of low capacity diesel power plant.                | 07 |
| Q.4 | a) Elaborate ash handling and dust collection system in thermal plants.        | 07 |
|     | b) Explain in detail two lubrication systems used in diesel engines.           | 07 |
| Q.5 | Write short notes on.  |    |
|     | a) Super charging of diesel engine.  | 05 |
|     | b) Over feed stokers.  | 05 |
|     | c) Cooling system for diesel engines.  | 04 |

**Section B**

- |     |  |    |
|-----|--|----|
| Q.6 | a) Explain in detail performance and operational characteristics of power plant. | 06 |
|     | b) Explain a Dam and different types of dam.                                     | 06 |
| Q.7 | a) Explain in detail working principle of PWR reactor.                           | 07 |
|     | b) Explain general components of nuclear reactor.                                | 07 |
| Q.8 | a) Explain in detail four different types of spillways with neat sketches.       | 07 |
|     | b) Explain surge tank and different types of surge tanks.                        | 07 |
| Q.9 | a) Explain in detail Sodium Graphite Reactor.                                    | 07 |
|     | b) Explain in detail gas cooled reactor.   | 07 |

Q.10

Write short notes.

- a) Hydrograph.
- b) CANDU reactor.
- c) Storage and Pondage.

05  
05  
04

Total No. of Printed Pages:4

**SUBJECT CODE NO:- H-168**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Theory of Machines - I**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
1. Q.No.1 and Q.No.6 are compulsory.
  2. Attempt any two questions out of remaining from each section.
  3. Figures to the right indicate full marks.
  4. Draw neat sketches wherever necessary.
  5. Assume suitable data wherever necessary.

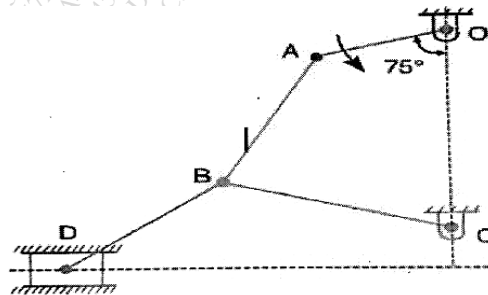
**Section A**

Q.1 Attempt any five:

10

- a) Define Tangential component of Acceleration.
- b) Define theory of machine.
- c) Define higher pair & Lower pair.
- d) Write classification of kinematic pair.
- e) Inversion of mechanism.
- f) Define Space centrode & body centrode.
- g) State Kennedy theorem.
- h) Define Grublers' Criterion.
- i) What is successfully constrained Motion?
- j) Differentiate between single and double slider mechanism.

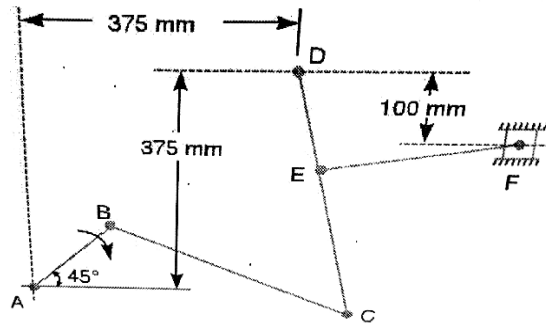
Q.2 In Fig the angular velocity of the crank OA is 600 r.p.m. Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of  $75^\circ$  to the vertical. The dimensions of various links are:  $OA = 28mm$ ;  $AB = 44mm$ ;  $BC = 49mm$ ; and  $BD = 46mm$ . The center distance between the centers of rotation O and C is 65mm. the path of travel of the slider is 11 mm below the fixed point C. the slider moves along a horizontal path and OC is vertical. Use I-Centre Method.



Q.3 The mechanism, as shown in fig. has the dimensions of various links as follows: 15  
 $AB = DE = 150 \text{ mm}; BC = CD = 450 \text{ mm}, ; EF = 375 \text{ mm}$ . The crank AB makes an angle of  $45^\circ$  with the horizontal and rotates about A in the clockwise direction at a uniform speed of 120 r.p.m. determine:

1. Velocity of the block F,
2. Angular velocity of DC, and
3. Rubbing speed at the pin C which is 50 mm in diameter.

Use relative velocity method.

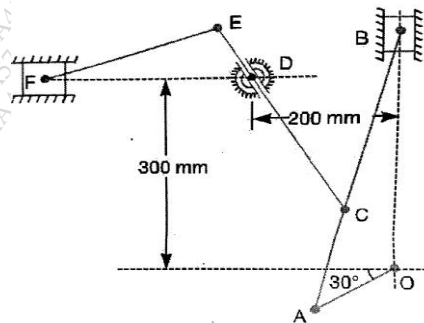


Q.4 a) In an reciprocating engine mechanism crank length is 250mm, connecting rod length is 950 mm. crank rotates at 200 r.p.m clockwise which makes an angle  $45^\circ$  with IDC. Find 10  
 1) Velocity and acceleration of piston  
 2) Angular velocity and angular acceleration of connecting rod.  
 (Use Klein's Construction Method)

b) Explain with neat sketch working of Oldham's Coupling. 05

Q.5 Fig. shows a mechanism in which the crank OA, 100 mm long rotates clockwise about O at 130 r.p.m. the connecting rod AB is 400 mm long. The rod CE, 350 mm long, is attached to AB at C, 150 mm from A. this rod slides in a slot in a trunnion at D. the end E is connected by a link EF, 300 mm long, to the horizontally moving slider F. Find 15

- 1) velocity of slider F.
- 2) Acceleration of slider F.
- 3) Angular acceleration of EF.



Section B

- Q.6 Attempt any five: 10
- Explain working principle of brake.
  - Define Pressure angle.
  - Define Prime circle and trace point
  - Define Self Energizing.
  - Define Dynamic Balancing
  - Define Hammer blow.
  - Reciprocating balancing is partial balancing, justify.
  - Define Swaying Couple.
  - Define absorption dynamometer.
  - Write classification of brake.

Q.7 Draw the profile of cam that gives the lift of 40 mm to the rod. Carrying a 20 mm diameter roller. 15  
 The axis of roller passes through the center of cam. The least radius of cam is 50 mm. the rod is to be lifted with SHM in a 90° Rotation of cam and suddenly returns to its original position during 180° revolution with SHM. Remaining is dwell.

- Q.8
- Explain with neat sketch belt transmission dynamometer. 03
  - A band brake acts on the 3/4th of circumference of a drum of 460 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 250 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force is applied at 510 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the
    - Anticlockwise direction, and
    - Clockwise direction. 12

Q.9 Four masses A, B, C and D as shown below are to be completely balanced. 15

	A	B	C	D
Mass (kg)	-	30	50	40
Radius (mm)	180	240	120	150

The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. Find: The magnitude and the angular position of mass A; and The position of planes A and D.

Q.10 The following data apply to an outside cylinder uncoupled locomotive: 15

Mass of rotating parts per cylinder = 360 kg; Mass of reciprocating parts per cylinder = 300 kg; Angle between cranks =  $90^\circ$ ; Crank radius = 0.3 m; Cylinder centers = 1.75 m; Radius of balance masses = 0.75 m; Wheel centers = 1.45 m.

If whole of the rotating and two-thirds of reciprocating parts are to be balanced in planes of the driving wheels, find:

1. Magnitude and angular positions of balance masses,
2. Speed in kilometers per hour at which the wheel will lift off the rails when the load on each driving wheel is 30kN and the diameter of tread of driving wheels is 1.8m, and
3. Swaying couple at speed arrived at in (2) above.

Total No. of Printed Pages:02

**SUBJECT CODE NO: H-223**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Elective-II: Industrial Engineering**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

N.B 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 indicates full marks.
  - 3) Assume suitable data if required & State it clearly.

**SECTION – A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) Define productivity. How would you measure productivity? Explain.   | 06 |
|     | b) 'Productivity is a means for increasing the welfare of the nation'. Justify the statement.                      | 07 |
| Q.2 | a) Explain work – study procedure.   | 07 |
|     | b) Describe the concept of basic work content and excess work content. Enlist the reasons for excess work content. | 06 |
| Q.3 | a) How is the job selected for method study?   | 07 |
|     | b) What are primary and secondary questions in critical examination? How they are useful?                          | 06 |
| Q.4 | a) Define two handed process chart and construct it for the following task: Assembly of nut and bolt.              | 09 |
|     | b) Explain various method study symbols.   | 04 |
| Q.5 | Write short note on the following ( <u>any two</u> )   | 14 |
|     | a) Principles of motion economy related to use of the human body.  |    |
|     | b) Design of information displays.   |    |
|     | c) Workplace design aspects.   |    |



SECTION – B

Q.6 a) The following table shows a time study data: 07

Sr. No.	Element	Cycle time			Performance rating
		1	2	3	
1	Get two cases	0.5	0.4	0.5	1.05
2	Put two parts into cases	1.0	1.5	1.3	1.15
3	Clamp part in position	2.3	2.4	2.7	0.95

Take relaxation allowance as 15% and find the standard time.

b) Explain synthetic data technique for work measurement. 06

Q.7 a) What is performance rating? Why it is required to rate the worker? What are different rating methods? 08

b) Explain various types of elements with example. 05

Q.8 a) Why it is necessary to give allowances? What are different types of allowances? 05

b) What is job evaluation? 03

c) What is merit rating & how it helps the industries? 05

Q.9 a) What are the implications of QC for kaizen? 06

b) Explain the working of Kanban system? 07

Q.10 Write short note on the following(any two) 14

- i) Seven wastes (JIT – TPS concept).
- ii) Internal & external setup in SMED
- iii) Maynard operation sequence Technique (MOST)

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-521**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECHANICAL)**  
**Design Of Machine Elements -I**  
**(REVISED)**

[Time: Three Hours]

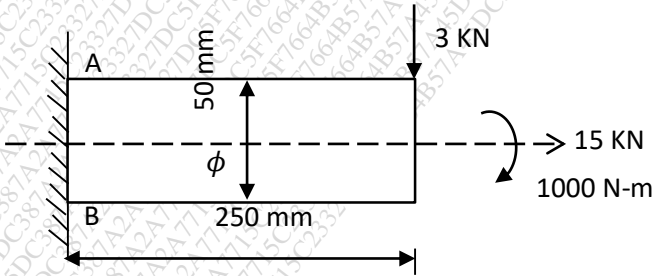
[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Q.No.1 and Q.No.6 are compulsory.
2. Solve any two questions from remaining in each section.
3. Assume suitable data if necessary.

**Section A**

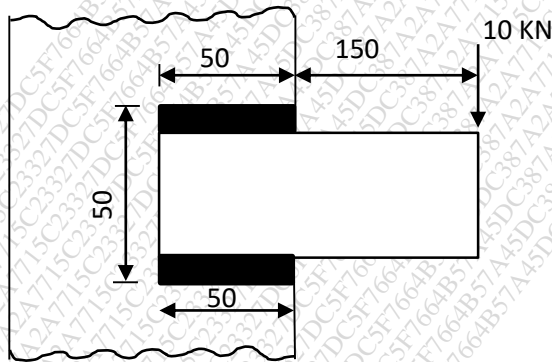
- Q.1 Solve any five: 10
- i) Define machine design and classify.
  - ii) Define ergonomics
  - iii) What is preferred series?
  - iv) Draw stress-strain diagram.
  - v) Explain mechanical advantage of lever.
  - vi) Why hexagonal head is preferred for cap screw?
- Q.2 A shaft, as shown in fig is subjected to a bending load of 3 KN, pure torque of 1000 N-M and an axial pulling force of 15 KN. Calculate the stresses at A and B. 15
- 
- Q.3 Design a knuckle joint to transmit 150 KN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. Draw neat sketch and specify major dimensions. 15
- Q.4 Design a muff coupling to connect two shafts transmitting 25 KW power at 360 rpm. Shaft and key are made of plain carbon steel 3008 having yield strength 400 N/mm<sup>2</sup> in tensile and compression. Sleeve is made of grey cast iron FG200 having ultimate tensile strength 200 N/mm<sup>2</sup> factor of safety for shaft and key is 4 and for sleeve is 6. 15
- Q.5 A vertical two start square threaded screw of a 100 mm mean diameter and 20 mm pitch supports a vertical load of 18 KN. The axial thrust on the screw is taken by a collar bearing of 250mm outside diameter and 100 mm inside diameter. Find force required at the end of a lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20. 15

Section B

- Q.6 Solve any five: 10
- i) What is stress concentration?
  - ii) Explain fatigue failure?
  - iii) Explain throat and leg of weld.
  - iv) Enlist types of failure in riveted joint.
  - v) Define stiffness of spring.
  - vi) Give significance of Wahl factor.

Q.7 A circular bar of 500 mm length is supported freely at its two ends it is acted upon by a central concentrated cyclic load having a minimum value of 20 KN and a maximum value of 50 KN. Determine the diameter of bar by using a factor of safety of 1.5 size effect of 0.85, surface finish factor of 0.9. The material properties of the bar are given by –ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa. 15

Q.8 A welded connection of steel plates, as shown in fig is subjected to an eccentric force of 10KN. Determine the throat dimension of the Wolds, if the permissible shear stress is limited to 95 N/mm<sup>2</sup>. Assume static conditions. 15



Q.9 It is required to design a helical compression spring subjected to a maximum force of 1250 N. the deflection of the spring corresponding to maximum force should be approximately 30 mm. the spring index can be taken as 6. The spring is made of patented and cold drawn steel wire. The ultimate tensile strength and modulus of rigidity of spring material are 1090 and 81370 N/mm<sup>2</sup> respectively. The permissible shear stress for spring wire should be taken as 50% of ultimate tensile strength. Design the spring and calculate Dim<sup>n</sup> 15

- i) Wire dia
- ii) mean coil dia
- iii) Active coils
- iv) Free length
- v) Pitch

Q.10 Derive the equation for Nipping of leaf spring. 15

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-528**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECHANICAL)**  
**Materials And Metallurgy**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

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

- N.B
- i. Each section consists of five questions.
  - ii. Question no.1 & 6 are compulsory.
  - iii. Attempt any two questions from remaining four questions.
  - iv. Figures to the right indicate full marks.

**Section A**

- |     |  |                         |
|-----|--|-------------------------|
| Q.1 | Solve any five.  | 10                      |
|     | <p>A) Explain the term “Unit Cell”.<br/>           B) Define coordination number.<br/>           C) Define equilibrium phase diagram. Why it is necessary to study.<br/>           D) Explain the term Eutectoid. Write eutectoid reaction found in Fe- C diagram.<br/>           E) How to determine number of atoms per unit cell. Determine it for FCC.<br/>           F) State the objectives of heat treatment of steel.<br/>           G) Enlist seven basic crystal systems with their edge lengths &amp; unit cell angles.</p> |                         |
| Q.2 | <p>a) What do you mean by crystal defects? Classify crystal defects. Explain point defect.<br/>           b) Explain crystal lattice. Draw 14 Bravais crystal structures.</p>  | <p>07<br/>08</p>        |
| Q.3 | <p>a) What is solid solution strengthening? Explain.<br/>           b) Draw a neat sketch of Iron – Carbon equilibrium diagram showing all critical temperatures on it. Explain various invariant reactions in it.</p>   | <p>07<br/>08</p>        |
| Q.4 | <p>a) Describe Jominy end quench test for determining the hardenability of steel.<br/>           b) State the purpose of Annealing heat treatment. Explain the process. How it is differ from normalizing.</p>   | <p>07<br/>08</p>        |
| Q.5 | <p>a) Define Atomic packing factor. Determine APF for B.C.C.<br/>           b) What is Gibbs phase rule? How it is applied for a cooling curve of pure iron.<br/>           c) What is nitriding? Explain the process of nitriding.</p>  | <p>05<br/>05<br/>05</p> |

## Section B

- Q.6 Solve Any Five. 10
- What is  $\alpha$  - Brasses? State important brasses from this group.
  - What is chilled cast Iron?
  - What is stainless steel? Why it is called so?
  - Define composite materials. State different classes of composite materials.
  - What type of stainless steel would you prefer for the following?
    - Wrist Watches
    - Razor blades
    - Utensils
    - Welded structure
  - What is Naval brass? Enlist the application of Naval brass.
  - Enlist various heat treatments used to improve service behavior of cast iron.
- Q.7
- What are different alloying elements in alloy steel? State effect of alloying elements. 07
  - Explain why gray cast iron is softer than white cast iron? Explain mechanical characteristics 08 of gray cast iron.
- Q.8
- What is  $\alpha - \beta$  brass? Explain different important brasses from this group. How it is differ 08 from  $\alpha$  - Brasses?
  - State the properties & application of aluminum & aluminum alloys. 07
- Q.9
- State the importance of Nano technology. Enlist different applications of Nano technology. 07
  - What is a composite material? Explain polymer based composite with example. 08
- Q.10
- What are properties of tool steel? Explain HSS tool steel. 05
  - Explain Beryllium bronze in details. 05
  - Explain properties & applications of metal matrix composite. 05

Total No. of Printed Pages:3

**SUBJECT CODE NO:- H-535**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECHANICAL)**  
**Fluid Mechanics And Machines**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Questions no.1 and 6 is compulsory.
2. Solve any two questions from section A and section B
3. Figures to the right indicate full marks.
4. Draw diagrams or graphs wherever required
5. Assume suitable data if necessary.

**Section A**

- Q.1 Attempt any five of the following 10
- 1) One liter of crude oil weight 9.6N calculate its specific weight and density.
  - 2) Define steady flow and Non- uniform flow.
  - 3) Convert 30cm of oil column in  $N/m^2$ . Take specific gravity of oil 1.2.
  - 4) Define convective and local accelerations.
  - 5) What is buoyancy and center of buoyancy ?
  - 6) If the surface tension at air water interface is 0.069 N/M, what is the pressure difference between inside and outside of an air bubble of diameter 0.009mm?
  - 7) Define circulation.
- Q.2 a) Find the total pressure and position of centre of pressure on a triangular plate of base 2m and height 3m which is immersed in water in such a way that the plane of the plate makes an angle of  $60^\circ$  with the free surface of the water. The base of the plate is parallel to water surface and at a depth of 2.5m from water surface. 08
- b) What is venturimeter? Derive an expression for the discharge through a venturimeter. 07
- Q.3 a) i) Define and explain viscosity? State their unit for measurement of viscosity and kinematic viscosity. 04
- ii) The space between two square flat parallel plates is filled with oil. Each side of the plate is 720mm. The thickness of the oil film is 15mm. The upper plate which moves at 3m/s requires a force of 120N to maintain the speed. Determine 04
- i) The dynamic viscosity of the oil.
  - ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95.
- b) A pipeline carrying oil of specific gravity 0.87 changes in diameter from 200 mm diameter at a position A to 500mm diameter at a position B which is A meters at a higher level. If the pressures at A and B are  $9.81N/cm^2$  and  $5.886 N/a$  respectively and the discharge is 200 liters/sec determine the loss of head and direction of flow. 07

- Q.4 a) A solid cylinder 4m in diameter and 4m high is floating in water with its axis vertical. If its specific gravity is 0.6 find the metacentric height also state whether the equilibrium is stable or unstable and explain equilibrium condition of floating bodies. 07
- b) State and derive the continuity equation in three- dimensions Cartesian coordinates. 08
- Q.5 a) Define and explain briefly the following 07
- i) Velocity potential ii) stream function  
Also explain Relation between stream function and velocity potential
- b) 360 liters per second of water is flowing in a pipe The pipe is bent by 120° The pipe bent measures 360mm × 240mm and volume of the bend is 0.14m<sup>3</sup> The pressure at the entrance is 73 KN/m<sup>2</sup> and the exit is 2.4m above the entrance section. 08

**Section – B**

- Q.6 Attempt any five of the following 10
- 1) Define the term dimensional homogeneity with examples.
  - 2) What are the characteristics of a boundary layer?
  - 3) Define boundary layer thickness and displacement thickness.
  - 4) Define an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.
  - 5) State hydraulic function of casing which is used for centrifugal pump.
  - 6) Classify turbines according to direction of flow
  - 7) What do you mean by net positive suction head (NPSH)?
- Q.7 a) Obtain non karman momentum integral equation. 08
- b) The velocity distribution in the boundary layer is given by  $\frac{u}{U} = \frac{3}{2} \frac{y}{\delta} - \frac{1}{2} \frac{y^2}{\delta^2}$ ,  $\delta$  being boundary layer thickness. 07
- Calculate the following
- i) The ratio of displacement thickness to boundary layer thickness  $[\frac{\delta^*}{\delta}]$
  - ii) The ratio of momentum thickness to boundary layer thickness  $(\frac{\theta}{\delta})$

- Q.8 a) The discharge Q of a centrifugal pump depends upon the mass density of fluid (P) the speed of the pump (N) the diameter of the impeller (D) the manometric head (H<sub>m</sub>) and the viscosity of fluid ( $\mu$ ) show that 08

$$Q = ND^3 \phi \left[ \frac{\delta H}{N^2 D^2}, \frac{\mu}{PND^2} \right] \text{ by using}$$

Dimensional analysis

- b) What are the advantages and applications of model testing Also explain similarities in model Analysis 07

- Q.9 a) A single jet pelton wheel runs at 300nm under a head of 510m. The jet diameter is 200mm 08 its deflection inside the bucket is  $165^{\circ}$  and its relative velocity is reduced by 15% due to friction determine
- Water power
  - Resultant force on the bucket
  - Overall efficiency
- Take : mechanical losses = 3% co-efficient of velocity = 0.98 and speed ratio = 0.46
- b) Define specific speed of a centrifugal pump derive an expression for the same. 07
- Q.10 Write short notes on any three of the following. 15
- Draft tube
  - Non-dimensional numbers
  - Classification of turbines
  - Multi-stage centrifugal pump



Total No. of Printed Pages:3

**SUBJECT CODE NO:- H-542**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECHANICAL)**  
**Theory Of Machine-II**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Q.No.1 & 6 are compulsory.
2. From remaining four questions, attempt any two questions from each section.
3. Assume suitable data, wherever necessary.
4. Use of non-programmable calculator is permitted.

**Section A**

- Q.1 Attempt any five: 10
- a) State "Law of gearing".
  - b) Define circular pitch. Give its formula.
  - c) Define compound gear train.
  - d) Define pressure angle. State the significance of pressure angle.
  - e) Define gyroscope. State application of it.
  - f) Define steering and pitching of ship.
  - g) What do you mean by axis of precession?
- Q.2 05
- a) Explain in details interference and undercutting in involute gears.
  - b) The following data refers to two mating involute gears of  $20^\circ$  pressure angle. No of teeth on pinion = 20, gear ratio = 2, speed of pinion = 250 r.p.m, module = 12mm. if the addendum of each wheel is such that the path of approach and path of recess on each side are half the maximum possible length, find.
    - a) Addendum for both the wheels
    - b) Length of arc of contact.
    - c) Maximum sliding velocity during approach and recess.
- Q.3 06
- a) Derive an expression for centre distance for a pair of spiral gears with neat sketch.
  - b) Two shafts inclined at an angle of  $65^\circ$  and with a least distance between them of 175 mm are to be connected by spiral gears of normal pitch 15 mm to give reduction ratio 3:1. Find suitable diameter and no. of teeth. Also determine the efficiency, if the spiral angle are determined by the condition of maximum efficiency. The friction angle is  $7^\circ$ .
- Q.4 06
- a) Explain effect of gyroscopic couple on four wheeler.
  - b) The turbine rotor of a ship having a mass of 200 kg at 2000 r.p.m and its radius of gyration is 0.30 m. if the rotation of the rotar is clockwise looking from the aft, determine the

gyroscopic couple set by the rotar when

- i) Ship takes a left hand turn at a radius of 300m at a speed of 30 km/hr.
- ii) Ship pitches with a bow rising at an angular velocity of 1 rad/sec.
- iii) Ship rolls at an angular velocity of 0.1 rad/sec.

- Q.5
- a) Derive an expression for gyroscopic couple 05
  - b) Explain merits and demerits of helical gears over spur gears. 05
  - c) Differentiate between involute and cycloidal tooth profile. 05

**Section B**

- Q.6 Attempt any five: 10
- a) What do you mean by centrifugal tension in belts?
  - b) Enlist applications of v-belts
  - c) Differentiate between flat belt drive and v-belt drive.
  - d) What is the function of governor? How does it differ from that of a flywheel?
  - e) What is meant by effort and power of a governor?
  - f) Define the term vibration isolation.
  - g) What is meant by longitudinal vibration? Draw a sketch of it.

- Q.7 08
- a) Define and explain.
    - i) Stability
    - ii) Sensitiveness
    - iii) Hunting
    - iv) Isochronism
  - b) A proell governor has a arms of 300 mm length. The upper arms are hinged on the axis of rotation. Whereas the lower arms are pivoted at a distance of 35mm from the axis of rotation. The extensions of lower arms to which the balls are attached are 100 mm long. The mass of each ball is 8kg and the mass on the sleeve is 60kg. At the minimum radius of rotation of 200 mm, the extensions are parallel to the governor axis. Determine the equilibrium speed of the governor for the given configuration. What will be the equilibrium speed for the maximum radius of 250 mm? 07

- Q.8 06
- a) What do you mean by initial tension in the belt? Derive an expression for it. 09
  - b) A chain drive is used for reduction of speed from 240 r.p.m. to 120 r.p.m. the number of teeth on driving sprocket is 20. Find the number of teeth on the driven shaft. If the pitch circle diameter on the given sprocket is 600 mm and centre to centre distance between two sprockets is 800 mm. determine the pitch and length of chain.

- Q.9 a) Derive an equation of motion and natural frequency for a simple pendulum using energy method. 07
- b) In a single degree damped vibrating system. A suspended mass of 8kg makes 30 oscillations in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine.
- i) Stiffness of the spring
  - ii) Logarithmic decrement
  - iii) Damping factor
  - iv) Damping coefficient
- Q.10 a) What do you mean by free vibration? Explain different types of free vibration. 07
- b) Explain slip and creep of belt. Also derive an expression for velocity ratio of belt drive in terms of slip. 08

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-549**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECHANICAL)**  
**Modern Management Techniques**  
**(Revised)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- 1) Five Questions in each Section.
  - 2) Question no.1 and 6 are compulsory.
  - 3) From remaining four questions, attempt any two questions from each Section.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | Attempt any five:- (2 marks each)  | 10 |
|     | <ol style="list-style-type: none"> <li>a) What is TQM?</li> <li>b) Draw Fishbone Diagram with example.</li> <li>c) Define- Just in Time</li> <li>d) What is the Need of Management?</li> <li>e) Enlist various wastes (Mudas)</li> <li>f) What is SMED?</li> <li>g) Explain Pareto Diagram.</li> </ol> |    |
| Q.2 | a) Explain various Principles of Management.   | 08 |
|     | b) Explain withdrawal and production KANBAN.   | 07 |
| Q.3 | a) What are the various steps to create value stream Map.  | 08 |
|     | b) Explain Toyota Production System.   | 07 |
| Q.4 | a) Explain Seven Problem Solving Tools.  | 08 |
|     | b) Explain Role of Set up time and lot size in JIT.  | 07 |
| Q.5 | a) Explain One and Two Card Kanban.  | 08 |
|     | b) Explain 'Single Minute Exchange of Dies.'   | 07 |

Section B

- Q.6 Attempt any five:- (2 marks each) 10
- a) Define – Process Capability
  - b) What is MTTR?
  - c) Define-Rate Efficiency
  - d) Define-Quality Rate
  - e) What is the difference between Invention and Innovation?
  - f) What is PDCA Cycle?
  - g) Define - Six Sigma.
- Q.7 a) Explain various types of Maintenance. 08
- b) Explain Reliability Centered Maintenance. (RCM) 07
- Q.8 a) A plant is operating on three-shift Basis. Time not available due to various reasons including preventive maintenance = 21 Hours per week. The unit produced 10,000 pieces of the item in a week, which contained 100 defectives. The Machine was operated at 80% of its capacity on an average. The Capability of the process is to produce 11,000 pieces per week. Calculate overall equipment efficiency? 08
- b) Explain White Hat Thinking. 07
- Q.9 a) Explain Quality Function Deployment. Also state its merits and demerits. 08
- b) Explain Green Hat Thinking. 07
- Q.10 a) Explain the Principle, Description and Implementation of 5S. 08
- b) Explain Relationship between QWL (Quality of work life) and WLB (Work Life Balance) 07

Total No. of Printed Pages:2

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

[Time: Three Hours]

[Max.Marks:80]

N.B

Please check whether you have got the right question paper.

- i) Attempt any three (3) questions , from each section.
- ii) Figures to right indicate full marks.

**Section – A**

- |     |   |                               |
|-----|---|-------------------------------|
| Q.1 | <ol style="list-style-type: none"> <li>a) Define following robotics terms               <ol style="list-style-type: none"> <li>i) Robot</li> <li>ii) Payload</li> <li>iii) Reach</li> <li>iv) Work Envelope</li> <li>v) End-Effector</li> </ol> </li> <li>b) Compare Hydraulic &amp; electric drives for Robotic</li> <li>c) Give the explanation of VAL II Language for following commands:               <ol style="list-style-type: none"> <li>i) MOVES</li> <li>ii) MOVE</li> <li>iii) MOVEST</li> <li>iv) MOVET</li> <li>v) TEACH</li> </ol> </li> </ol> | <p>05</p> <p>04</p> <p>05</p> |
| Q.2 | <ol style="list-style-type: none"> <li>a) What are the Types of robot motion? Explain Continuous Path motion with neat sketch.</li> <li>b) What are the criteria for classification of Sensor and explain Tactile Sensors.</li> <li>c) Explain the following sensor characteristics               <ol style="list-style-type: none"> <li>(a) Range</li> <li>(b) Response</li> <li>(c) Accuracy.</li> </ol> </li> </ol>  | <p>05</p> <p>05</p> <p>03</p> |
| Q.3 | <ol style="list-style-type: none"> <li>a) Explain working with neat sketch the Image acquisition Charge-Coupled Device for Robot vision.</li> <li>b) What are the general considerations in path Description and Generation for Robot Motion?</li> <li>c) The Co-ordinate of point <math>q_{(abc)}</math> is given by <math>(7,5,3)^T</math> which is rotated about OX axis of reference frame OXYZ by an angle <math>60^\circ</math>. Determine the Co-ordinate of point <math>q_{(x,y,z)}</math></li> </ol>   | <p>05</p> <p>05</p> <p>03</p> |
| Q.4 | <ol style="list-style-type: none"> <li>a) Derive the rotation matrix for transformation about X axis</li> <li>b) Write short Note on Robot Applications for – Material Handling</li> <li>c) Explain the Servo and Non-servo Robot Control System with Block diagrams.</li> </ol>  | <p>05</p> <p>04</p> <p>04</p> |

- Q.5 a) Write short Note on 06  
 (i) Mechanical end effectors  
 (ii) Vacuum end effectors  
 (iii) Magnetic end effectors  
 b) Coordinate of point  $P_{(abc)}$  in mobile frame OABC is given by  $[4, 3, 2\sqrt{3}]^T$ . If the frame OABC is rotated by  $60^\circ$  with respect to OXYZ, find the co-ordinate of  $P_{xyz}$  with respect to base frame. 03  
 c) Compare joint space versus Cartesian Space for robotic trajectories. 04

**Section – B**

- Q.6 a) Compare the Fixed and Programmable Automation w.r.t. function, limits and applications. 06  
 b) Explain the various reasons for automating as need of time. 04  
 c) Explain the Benefits and Limitations of automation. 04
- Q.7 a) Write short note on Industrial Control Applications for Water Treatment Plant 07  
 b) What is Sequence and Logic Control for automation. 06
- Q.8 a) Write Note on 07  
 i) Automated Guided Vehicle Systems  
 ii) Automated Storage/Retrieval Systems  
 b) Explain the following PLC Count with one example 06  
 i) Count Up  
 ii) Count Down  
 iii) Reset
- Q.9 a) Compare Logic and Sequence Control with Analog Control with example. 07  
 b) Distinguish between Contact vs. Non-contact inspection. 06
- Q.10 a) Explain the Constructional and Working Details of CMM 07  
 b) What are Prose and cons of Process industries Verses Discrete-Manufacturing Industries in term of automation. 06

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-502**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Prod)**  
**Elective-II: Non-Conventional Machining Process**  
**(OLD)**

[Time: Three Hours]

[Max.Marks: 100]

Please check whether you have got the right question paper.

- N.B
- 1) Question No.5 and Question No.10 are compulsory.
  - 2) Solve any two questions from remaining in each section.
  - 3) Assume suitable data wherever required & state it clearly.
  - 4) Figures to the right indicate full marks.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) Explain the procedure of measurement of tool wear with neat sketch.                       | 08 |
|     | b) Explain different tool failure criterions and effect of process parameters on tool life.  | 08 |
| Q.2 | a) Explain Abrasive Jet Machining.   | 08 |
|     | b) Explain how the various process parameters of Abrasive Jet Machining affects the process. | 08 |
| Q.3 | a) Explain the basic EDM circuitry & spark erosion generators.                               | 08 |
|     | b) Explain EDM principle of operation & mechanism of metal removal.                          | 08 |
| Q.4 | a) Explain the need for non-conventional machining processes.                                | 08 |
|     | b) Classify the non-conventional machining processes and explain any one with neat sketch.   | 08 |
| Q.5 | Write short note on any two.   | 18 |
|     | a) Mechanism of metal removal in Ultrasonic machining.                                       |    |
|     | b) Elements of USM.  |    |
|     | c) Applications of USM.  |    |

**Section B**

- |     |  |    |
|-----|--|----|
| Q.6 | a) Explain the principle and classification of ECM process.                    | 08 |
|     | b) Explain Electro-Chemical Grinding with neat sketch.                         | 08 |
| Q.7 | a) Explain the principle of generation of LASER with neat sketch in LBM.       | 08 |
|     | b) Explain different types of LASERS in LBM.                                   | 08 |
| Q.8 | a) Explain the mechanism of metal removal in Ion Beam Machining.               | 08 |
|     | b) Explain the process characteristics and applications in Ion Beam Machining. | 08 |



- Q.9 a) Explain with neat sketches Plasma Arc Machining.
- b) Explain different types of torches in PAM.

08

08

Q.10 Write short note on any two.

18

- a) Thermal and Non-thermal type EBM.
- b) Process characteristics and applications of EBM.
- c) Electro-Chemical Honing.

Total No. of Printed Pages:3

**SUBJECT CODE NO: H-158-A**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**Tool Engineering**  
**(OLD)**

[Time: Four 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 and dimensions if required.
- 3) All dimensions are in mm

**Section A**

- |     |   |          |
|-----|---|----------|
| Q.1 | a) What is tool wear? Explain in detail the different types of tool wear.<br>b) In an orthogonal turning process, the chip thickness is 0.62mm, feed rate is 0.2mm/rev. and rake angle is $15^{\circ}$ . Calculate cutting ratio, chip reduction co-efficient, shear angle and dynamic shear strain involved in deformation process | 08<br>05 |
| Q.2 | a) Sketch and discuss the nomenclature of an internal broach.<br>b) Differentiate between orthogonal cutting and oblique cutting.   | 08<br>05 |
| Q.3 | a) Explain Taylor's tool life equation in detail. Enlist the various tool life criteria.<br>b) What is jig and fixture? Why jig and fixture are used.   | 08<br>05 |
| Q.4 | Design draw and dimension a drill jig to drill 4 holes of $\varnothing 8\text{mm}$ in a finished component shown in fig no.1  | 14       |
| Q.5 | Design draw and dimension a milling fixture to mill a slot in component as shown in fig no.2  | 14       |

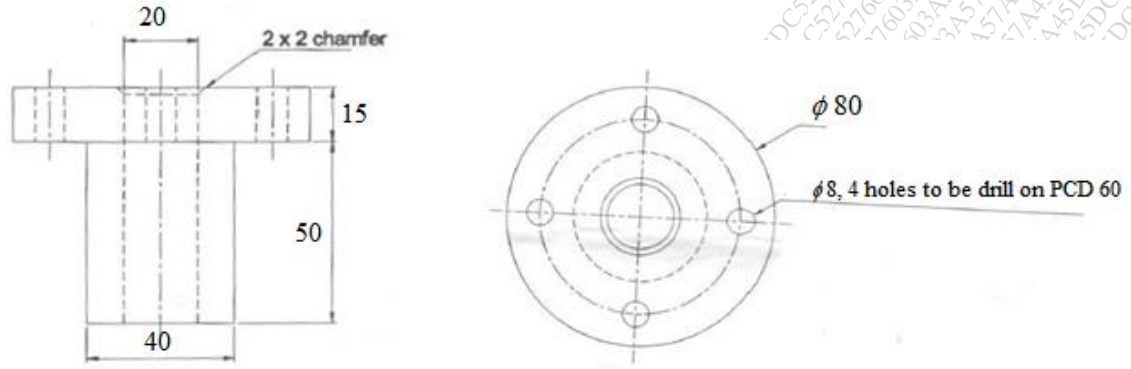


Fig. No.1

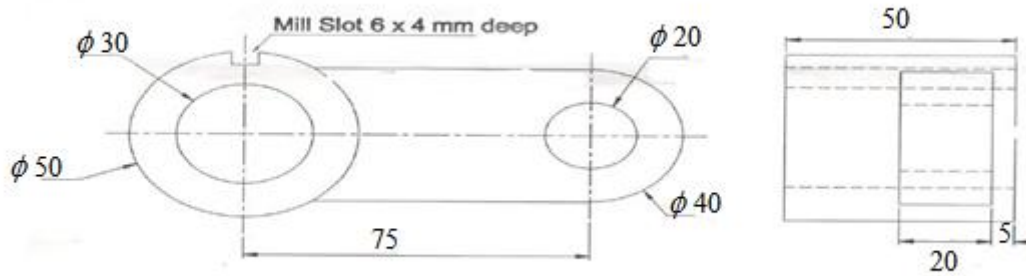


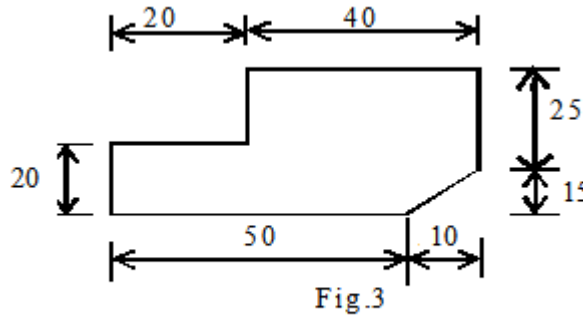
Fig. No. 2

**Section B**

- Q.6 a) What is stripper? What are various types of stripper? 07  
 b) What is centre of pressure? How it is determined? 06
- Q.7 a) How the size of blank and number of draws are decided for drawing a cylindrical cup? 07  
 b) Define bend allowance and spring back in bending of sheet metal 06
- Q.8 a) Explain close and open die forging. 07  
 b) Write short note on multi impression dies. 06

Q.9 a) Find out centre of pressure to blank a piece shown in figure 3

07

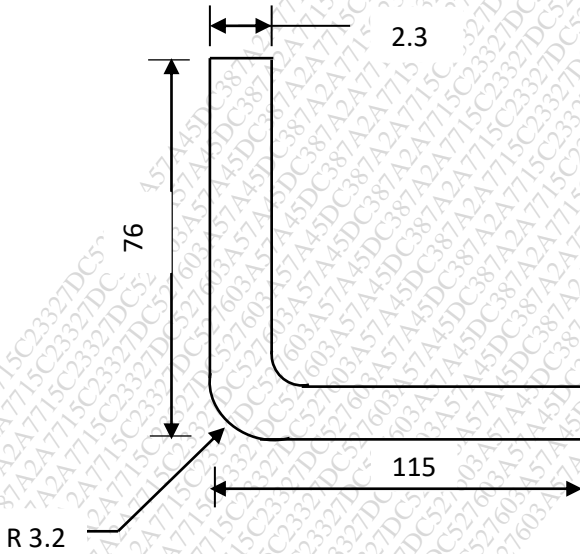


b) Explain types of bending dies.

06

Q.10 a) Determine the developed Length of part shown in figure 4

08



b) What are the different methods to reduce cutting forces?

06

Total No. of Printed Pages:04

**SUBJECT CODE NO: H-159-B**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**Tool Engineering**  
**(REVISED)**

[Time: Four Hours]

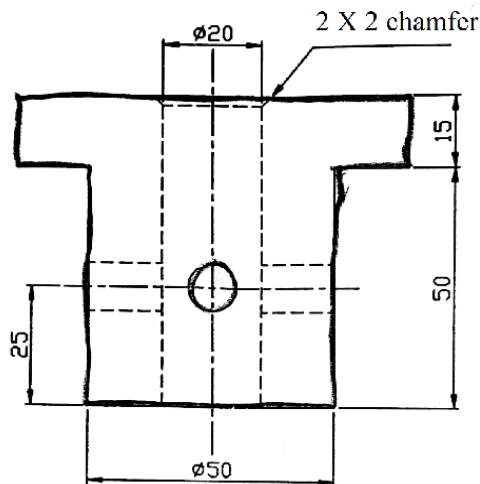
[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Q.4 & Q.8 are compulsory. Attempt any two questions from the remaining question of each section.
  - 2) Use drawing sheet for Q.4
  - 3) Assume suitable data and dimensions if required.
  - 4) All dimensions are in mm.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) What is tool wear? Explain in detail the different types of tool wear   | 07 |
|     | b) In an orthogonal turning process the chip thickness is 0.58mm, feed rate is 0.25mm/rev and rake angle is $15^{\circ}$ . Calculate cutting ratio chip reduction co-efficient, Shear angle and dynamic shear strain involved in deformation process | 05 |
| Q.2 | a) Explain the various elements of a single point cutting tool with help of neat sketch  | 07 |
|     | b) Differential between orthogonal and oblique cutting.  | 05 |
| Q.3 | a) Explain the use of setting block and tennon in fixture  | 07 |
|     | b) Draw a neat sketch of simple bridge clamp   | 05 |
| Q.4 | Design draw and dimension a drill jig to drill a holes of $\phi 10$ mm, 4holes in a finish component shown in fig.no.(1)   | 16 |



16

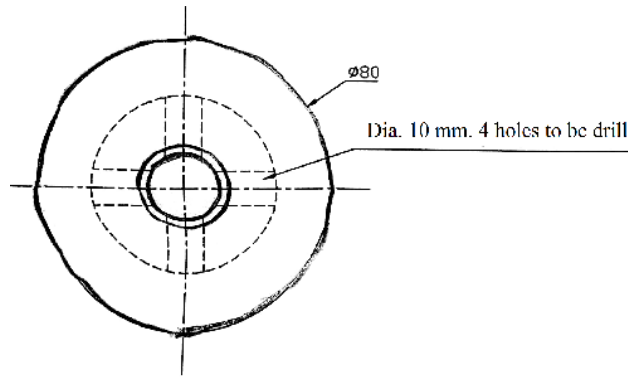


Fig.1

OR

Design and draw a milling fixture to mill the slot 10×10mm deep in a component shown in fig.no.(2)

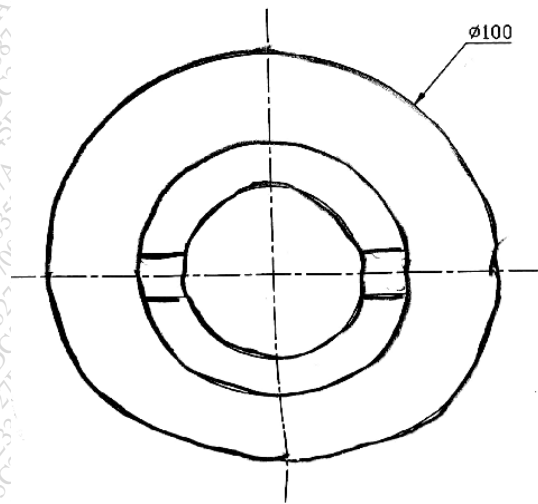
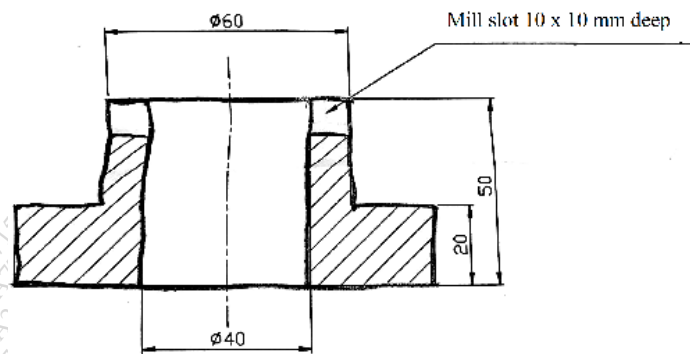


Fig.2

**Section 'B'**

- Q.5 a) Draw neat sketches of the following with nomenclature of their elements (Any Two) 12  
 i. Internal broach ii) Reamer iii) End mill cutter
- Q.6 a) What is mean by die clearance? Is the die clearance placed on the punch or die opening for a 07  
 blanking and piercing operation?  
 b) Explain the two general classification of stripper used in progressive die 05
- Q.7 a) What causes spring back in bending? Explain the way of combating spring back. 07  
 b) Explain "Bending terminology" with suitable sketch. 05
- Q.8 a) Design either progressive or compound die to blank the workpiece shown in figure3 Thickness 16  
 of blank 2.4mm shear strength  $420\text{N/mm}^2$  strip Length 2000mm. Design should include  
 1) Punch size and die opening size  
 2) Strip Layout  
 3) Center of pressure

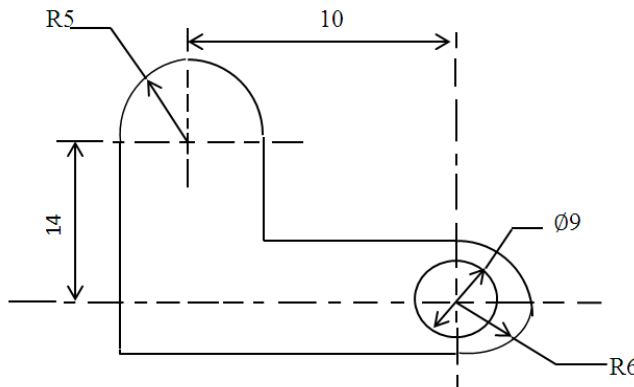


fig.3

**OR**

- b) A shell shown in figure 4 has a height of 48mm and a diameter of 48mm. The corner radius is 2mm and workpiece material is medium carbon steel (yield strength  $335\text{N/mm}^2$ ) and is 1mm thick. Design die for drawing operation.

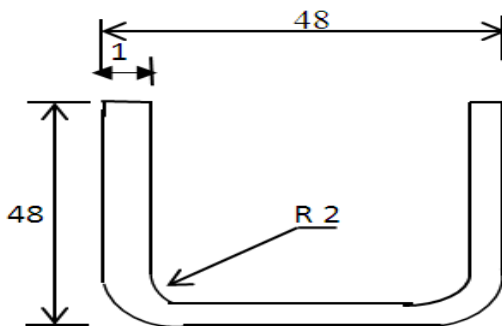


Fig.4

Total No. of Printed Pages:4

**SUBJECT CODE NO:- H-147**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**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 “Operations Research” and explain briefly its applications in industrial organizations. 05
- b) Two product A & B are to be manufactured on three machines P, Q, R. product A takes 10 Hrs on machine P, 6 Hrs on machine Q and 5 Hrs on machine R. the product B takes 7.5 Hrs on machine P, 9 Hrs on machine Q, 13 Hrs on machine R. the machining time available on these machines, P, Q, R respectively 75 Hrs, 54Hrs, 65Hrs per week. The manufacturer gets a profit of Rs. 60 for product A and Rs. 70 for product B. formulate LP model and find optimum product mix so as to get maximum profit graphically. 08
- Q.2 Solve by simplex method the following L.P. Problem 13
- Minimize  $Z = x_1 - 3x_2 + 3x_3$   
 Subject to,  $3x_1 - x_2 + 2x_3 \leq 7,$   
 $2x_1 + 4x_2 \leq -12,$   
 $-4x_1 + 3x_2 + 8x_3 \leq 10,$   
 $x_1, x_2, x_3 \geq 0$
- Q.3 Solve the following LPP by Big-M Method 13
- Minimize  $Z = 2x_1 + 3x_2$   
 Subject to,  $x_1 + x_2 \geq 5$   
 $x_1 + 2x_2 \geq 6$   
 $x_1, x_2 \geq 0$



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) A company has a team of four salesmen and there are four districts where the company wants to start its business. After taking into account the capabilities of salesmen and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is as below. Find the assignment of salesmen to various districts which will yield maximum profit. 07

District	1	2	3	4
Salesman				
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

b) 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? 07

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

**Section B**

- Q.6 a) A motor garage has only one mechanic who specialist in high-speed cars. Number of customers with high speed car follows Poisson 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:
- i) Utilization Parameter
  - ii) Probability that system is idle
  - iii) Average time mechanic is free on 8 Hr. per day,
  - iv) Expected number of customers in garage.
- b) There are five jobs, each of which must go through machines A, B and C in the order ABC. Processing times are given in table. Determine a sequence for five jobs that will minimize the elapsed time T.

Job	Processing Times		
	A	B	C
1	8	5	4
2	10	6	9
3	6	2	8
4	7	3	6
5	11	4	5

- Q.7 a) Solve a game with saddle point method. Calculate:
- i) Maximin, Minimax Value
  - ii) Value of Game
  - iii) Optimal strategy for both the player
  - iv) Is the game fair and strictly determinable?

		Player 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.

		Player B			
		B1	B2	B3	B4
Player A	A1	3	2	4	0
	A2	3	4	2	4
	A3	4	2	4	0
	A4	0	4	0	8

- Q.8 a) What is inventory? Also explain the classification of inventories. 05  
 b) Alpha industry estimates that it will sell 12000 units of its product for the forth coming year. 08  
 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.  
 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 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:4

**SUBJECT CODE NO:- H-134**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Theory of Machines – I**  
**(OLD)**

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

N.B

1. Q.1 & Q.6 are compulsory
2. Attempt any two questions remaining from each section
3. Assume suitable data if required

**Section A**

- Q.1 Attempt any five 10
- 1) Define Kinematic chain
  - 2) List the different types of mechanism
  - 3) List the types of kinematic pairs according to the relative motion between its elements.
  - 4) Differentiate between lower & higher pair giving example.
  - 5) Sketch any two inversion of double slider crank chain
  - 6) Sketch any two inversion of single slider crank chain.
  - 7) Sketch whitworth's quick return mechanism
  - 8) What is velocity image?
  - 9) What is coriolis component of acceleration?
  - 10) What is an acceleration image?
- Q.2 The mechanism shown in figure 1 has the dimensions of various links as follows 15
- AB= DE= 150 mm  
 BC = CD = 450 mm  
 EF = 375 mm
- The crank AB makes an angle of  $60^\circ$  with the horizontal & rotates about 'A' in the clockwise direction at a uniform speed of 120 rpm
- Determine :
- 1) Velocity of the slider F,
  - 2) Angular velocity of DC and
  - 3) Rubbing speed at the pin C which is 50 mm in diameter

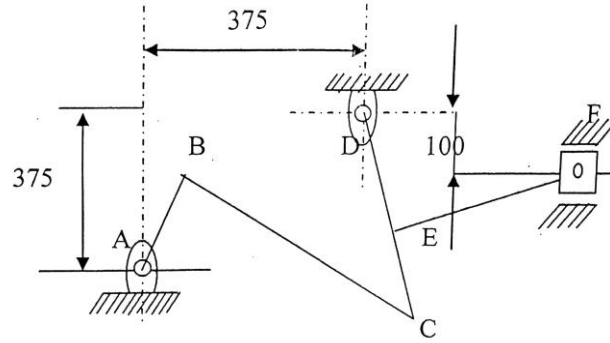


Fig. 1

Q.3 The lengths of various links of mechanism as shown in fig.2 are  $OA = 300\text{mm}$ ,  $AB = 1000\text{mm}$ ,  $CD = 800\text{mm}$  &  $AC = CB$ . Determine, for the given configuration the velocity of the slider D if the crank OA rotates at 60 rpm in the clockwise direction Also find the angular velocity of the link CD. Use instantaneous center method

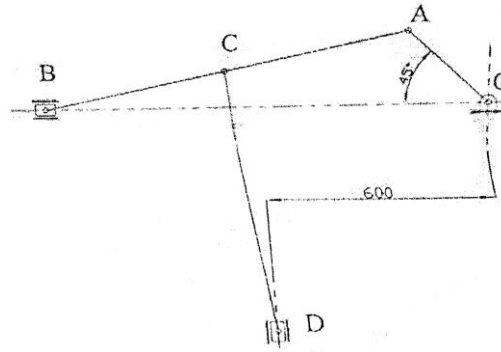


Fig. 2

Q.4 Figure 3 shows the mechanism used in two cylinder 60°V engine crank 2 rotates in clockwise direction at speed of 2000 rpm. Determine for the position shown the velocities and accelerations of the sliders B & D Given  $O_2A = 20\text{mm}$ ,  $AC = 20\text{mm}$ ,  $AB = BC = 60\text{mm}$  &  $CD = 50\text{mm}$

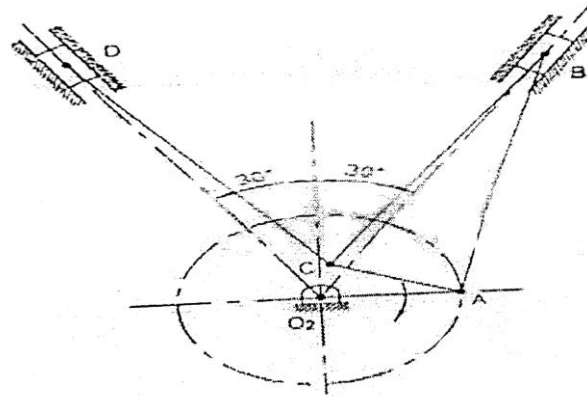


Fig. 3

- Q.5 a) In slider crank mechanism the length of crank & connecting rod are 100mm & 400 mm respectively. the crank rotates uniformly at 600 rpm clockwise when the crank has turned through  $45^\circ$  from the inner dead center, find by Ritterhaus construction 08
- 1) Velocity & acceleration of the slider
  - 2) Angular velocity & angular acceleration of connecting rod.
- b) What is the difference between piston effort, crank effort and crank pin effort? 07

### Section – B

- Q.6 Attempt any five 10
- 1) Sketch & label the geometric elements of cam profile
  - 2) Draw the sketch of cylindrical cam
  - 3) What is displacement diagram in cam
  - 4) Distinguish between brakes & dynamometer
  - 5) Describe the working of band & block brake
  - 6) Enumerate the types of brakes
  - 7) What is the necessity of balancing
  - 8) State the concept of self-locking of brake
  - 9) Deduce expression for swaying couple.
  - 10) Deduce expression for variation in tractive force
- Q.7 A cam is to give following motion to a knife edge follower: 15
- 1) To raise the follower through 30mm with uniform acceleration & deceleration during  $120^\circ$  rotation of the cam
  - 2) Dwell for next  $30^\circ$  of the cam rotation
  - 3) To lower the follower with simple harmonic motion during the next  $90^\circ$  rotation of the cam
  - 4) Dwell for the rest of the cam rotation the cam has a minimum radius of 30mm & rotates counter clockwise at a uniform speed of 840 rpm. Draw the profile of the cam if the line of stroke of the follower passes through the axis of the cam shaft. Also draw the displacement, velocity & acceleration diagrams for the motion of the follower for one complete revolution of the cam indicating main values.
- Q.8 A differential band brake has a drum with a diameter of 800mm. the two ends of the band are fixed to the pins on the opposite sides of the fulcrum of the level at distance of 40mm & 200mm from the fulcrum the angle of contact is  $270^\circ$  and the coefficient of friction is 0.2 determine the brake torque when a force of 600N is applied to the lever at a distance of 800mm from the fulcrum. 15

- Q.9 A, B, C, & D are your masses carried by a routing shaft at radii 150mm , 150mm , 100mm and 200mm respectively. the planes in which masses rotates are spaced at 300mm apart and the magnitude of masses B,C, and D are 10kg, 6kg & 5kg respectively. Find the required mass A and there relative angular settings of the four masses so that shaft shall be in complete balance. 15
- Q.10 An inside cylinder locomotive has its cylinder center lines 0.7m apart and has a stroke of 0.6m 15 the rotating masses per cylinder to 180kg the wheel center lines are 1.5m apart. The cranks are at right angle. The whole of the rotating and  $\frac{2}{3}^{\text{rd}}$  of the reciprocating masses are to be balanced by masses place at a radius 0.6m find the magnitude and the direction of balancing masses, find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 rpm.

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-133**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Thermodynamics -II**  
**(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) Use of steam table, mollier diagram permitted.
  - 3) Assume suitable data if required.

**Section A**

- Q.1 a) Explain steam generation controls. 06
- b) A Boiler evaporates 3.6 kg of water per kg of coal into dry saturated steam at 10 bar. The temperature of feed water is 40°C. Find 07
1. Factor of evaporation
  2. Equivalent evaporation
  3. Boiler efficiency, if calorific value of coal is 30 MJ/Kg.
- Q.2 a) Explain construction and working of Lo-effler Boiler. 07
- b) Discuss advantages of artificial draught over natural draught. 03
- c) Give classification of draught. 03
- Q.3 a) Find the mass of flue gases passing through Chimney when draught produced is 2 cm of water. Temperature of flue gases is 297°C and ambient temp is 27°C. The flue gases formed /kg of fuel burnt are 20 kg. Diameter of Chimney is 2 meter. Neglect frictional losses. 09
- b) Explain in detail nozzle efficiency. 04
- Q.4 A Nozzle is required to discharge 2 kg of steam per second. The nozzle is supplied with steam at 13 bar and 180°C. The discharge takes place at pressure of 1 bar. The expansion upto throat is isentropic & exit frictional resistance is 63 KJ/kg of steam. Taking inlet velocity of 75 m/s & throat pressure of 4 bar. Estimate
- i) Throat & exit area
  - ii) Overall efficiency of nozzle between inlet & exit.
- Q.5 Write short note on(Any two) 14
- a. Energy balance in Boiler
  - b. Condition for maximum discharge through Chimney
  - c. Metastable flow through nozzle



## Section B

- Q.6 a) What are sources of air leakage in condenser & explain effects of air leakage in condenser. 07
- b) Explain in detail cooling towers. 06
- Q.7 a) Explain central flow type of surface condenser. 05
- b) Explain the effect of superheat, inlet pressure and back pressure on performance of Rankine Cycle. 08
- Q.8 In a single heater regenerative cycle the steam enters the turbine at 20 bar, 400°C and exhaust pressure is 0.1 bar. The feed water is a direct contact type which operates at 5 bar. Find 13
- i) The efficiency of cycle
- ii) Steam rate
- iii) Mean temperature of heat addition
- Q.9 a) Differentiate between reciprocating and rotary compressor. 05
- b) A two stage single acting reciprocating compressor takes in air at the rate of  $0.2 \text{ m}^3/\text{sec}$ . 08  
The inlet pressure & temperature of air are 0.1mpa, 16°C. The air is compressed to a final pressure of 0.7 MPa. The intermediate pressure is ideal & intercooling perfect. The compression index in both the stages is 1.25 & compressor runs at 600 rpm. Neglecting clearance determine.
- i) Volume of each cylinder
- ii) Power required
- Q.10 Write short note on (Any two) 14
- a) Counter flow jet condenser
- b) Reheat cycle
- c) Screw compressor

Total No. of Printed Pages: 2

**SUBJECT CODE NO:- H-114**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**Automobile 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. Draw neat sketches wherever necessary
  - iii. Assume suitable data, if required
- “Section A”**
- Q.1 a. Give the classification of chassis 08  
b. What are the advantages of diesel engines in cars? 05
- Q.2 a. With the help of suitable diagrams, describe the constructional features of a diaphragm spring. 08  
type clutch, discuss its advantages & disadvantages relative to clutch employing helical spring.  
b. Define clutch. What are the functions and requirements of clutch? 05
- Q.3 a. What is an epicyclic gear box? Describe its principle with the help of a neat sketch. 07  
b. Explain with neat sketch construction & working of overdrive. What are its advantages? 06
- Q.4 a. Describe Macpherson strut assembly of independent suspension system and what are its 07  
advantages?  
b. What is the function of an anti-roll device in vehicles? Explain clearly how it performs the 06  
same in actual practice
- Q.5 a. Write short notes on (any two) 14  
i. Propeller shaft used in transmission system of a vehicle  
ii. Sliding mesh gear box  
iii. Leaf springs  
iv. Air suspension

**“Section B”**

- Q.6 a. Explain the terms: camber and castor. What are the effects of each on the steering 07  
characteristics of a vehicle?  
b. Sketch front axle of a car and show how it is connected with the stub axle. 06
- Q.7 a. Describe in detail the rack and pinion type manual steering gear by means of a simple 07  
sketch and discuss its advantages  
b. Describe in details the equipment to check wheel alignment and steering geometry 06

- Q.8 a. Explain with neat sketch a ‘hydraulic braking system’ what are the essential differences between mechanical brakes and hydraulic braking system? 07  
 b. What is the necessity of bleeding of breaks? Explain bleeding process. 06
- Q.9 a. Draw the layout of the air-conditioning system for a car and explain its working. 07  
 b. Describe with the help of neat sketch a battery ignition system 06
- Q.10 a. Write short notes on (any two) 14  
 i. Tubeless tyre and conventional tube tyre  
 ii. Factors affecting battery life  
 iii. Disc brakes  
 iv. Toe-in and Toe-out

Total No. of Printed Pages:1

**SUBJECT CODE NO: H-222**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**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) Solve any three questions from each section A & B
  - ii) Assume suitable data, if necessary

**Section A**

- Q.1 Explain Delaunay triangulation and the algorithm involved in detail 13
- Q.2
- a) Discuss the source panel method for the flow past an oscillating cylinder 08
  - b) Write down the basic equations of fluid dynamics 05
- Q.3
- a) Discuss the methods of grid generation 06
  - b) Explain concept of numerical dissipation 07
- Q.4 Explain the strong & weak formulations of a boundary value problem. 13
- Q.5 Short notes on(any two) 14
- i) Boundary layer equations & methods of solution
  - ii) Finite elements techniques
  - iii) Advantages of upwind differencing

**Section B**

- Q.6
- a) Explain Lax- wendroff time stepping method 07
  - b) Explain flux spitting schemes 06
- Q.7
- a) Explain simple pressure correction solver 06
  - b) Discuss incorporating boundary conditions for one dimensional conduction equation 07
- Q.8 Explain Runge-kutta time-stepping method in detail with emphasis on stability and accuracy of method 13
- Q.9 “The first order unwinding scheme is very diffusive in gradients in flow tend to be smeared out” justify the statement 13
- Q.10 Short notes on (any two) 14
- i) Semi-implicit scheme
  - ii) Vorticity transport formulation
  - iii) Finite volume method

Total No. of Printed Pages:2

**SUBJECT CODE NO: H-194**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**CAD/CAM/CAE**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

- N.B Please check whether you have got the right question paper.
- i) Answer any three questions from each section.
  - ii) Figures to the right indicate full marks.
  - iii) Assume suitable data whenever necessary and state it clearly.
  - iv) Draw neat sketches wherever necessary.

**Section A**

- |     |   |    |
|-----|---|----|
| Q.1 | a) Define the term CAD, and list down applications of CAD in manufacturing & explain any one in detail.   | 06 |
|     | b) Explain the generalised product lifecycle with the help of neat sketches, explaining the use of computers in it.   | 07 |
| Q.2 | a) Explain the functions to be performed by graphic software package.   | 06 |
|     | b) Discuss modern solid modelling techniques along with its advantages & disadvantages.   | 07 |
| Q.3 | A rectangle is defined in 2D-Space by its vertices as A(2,2), B(8,2), C(8,4) & D(4,2). Express them in matrix notation and perform the following transformation and show it graphically on graph paper. | 13 |
|     | i) Rotation in anticlockwise direction through an angle $90^\circ$ about its centroid.  |    |
|     | ii) Scaling the original Rectangle by 0.5units in X direction and 2 units in Y direction about the origin.  |    |
| Q.4 | a. Explain the characteristics of Beizer curves.  | 06 |
|     | b. Explain different mating conditions used in the assembly modelling.  | 07 |
| Q.5 | Write short notes on followings.( <u>any three</u> )  | 14 |
|     | a) Manufacturing data base & CAD/CAM  |    |
|     | b) B– Spline curve  |    |
|     | c) Solid representation techniques  |    |
|     | d) CIM  |    |
|     | e) Data input devices used in CAD   |    |

Section B

- Q.6 a. Define different types of automation also state its advantages and limitations. 06  
 b. What is group Technology? Distinguish between hierarchal & attribute type of coding system. 07
- Q.7 a. Explain the basic components of CNC and DNC system. 06  
 b. What is cutter tool compensation? Explain it with reference to CNC-Programming. 07
- Q.8 a. Explain different physical configuration of robots with neat diagram. 06  
 b. Enlist the applications of finite element analysis software & explain any one in detail. 07
- Q.9 Write a manual part program for machining a cast iron work piece to achieve the dimensions as shown in figure below. Assume the thickness of work piece as 10mm. 13

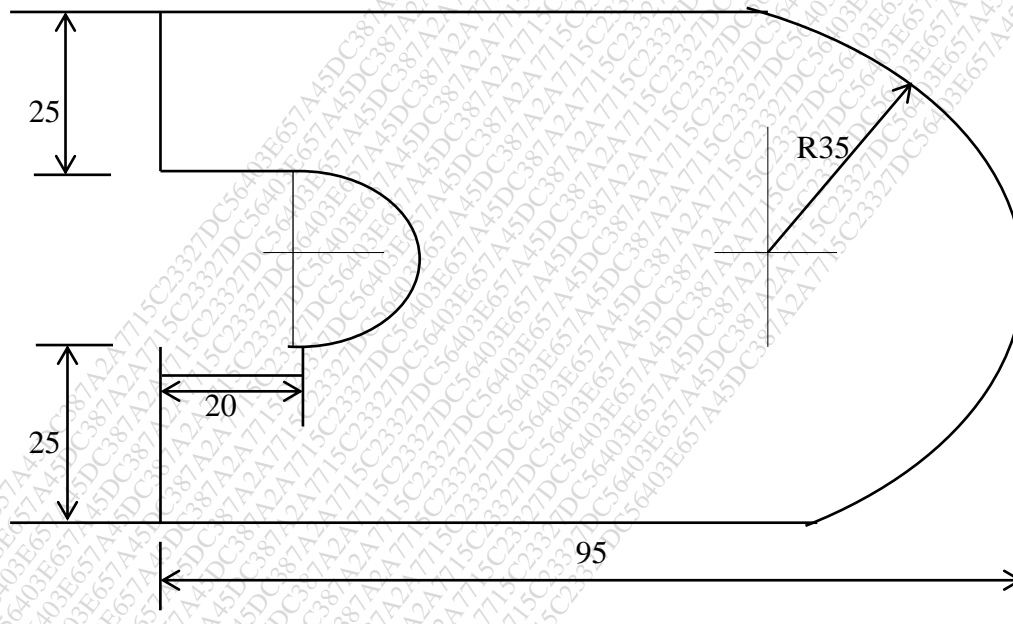


Figure 1

- Q.10 Write short notes on (any two) 14
- C.A.P.P
  - Drives for N.C./C.N.C. machines
  - End effectors used in robots

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-203**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Electrical Machines**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q.No.1 and Q.No.6 are compulsory.
  - ii) Solve any two questions from Q.2 to Q.5.
  - iii) Solve any two questions from Q.7 to Q.10.
  - iv) Assume suitable data wherever necessary.

**Section A**

- |     |  |          |
|-----|--|----------|
| Q.1 | Attempt the following (any five)   | 10       |
|     | <ol style="list-style-type: none"> <li>a) What is the function of Commutator in D.C. generator?</li> <li>b) Draw speed torque characteristics of D.C. shunt and series motor. Write their applications.</li> <li>c) Why D.C. shunt motor called as constant speed motor?</li> <li>d) A 4 pole d. c shunt generator has wave wound armature with 792 conductors the flux pole is 0.01241 wb. Determine the speed at which it should run to generate 240 volts on no load.</li> <li>e) How is unidirectional torque produced in case of D.C. motor?</li> <li>f) Write applications of stepper motor.</li> <li>g) Give two comparisons of lap and wave winding.</li> <li>h) Write applications of Brush less D.C. motor.</li> </ol> |          |
| Q.2 | <ol style="list-style-type: none"> <li>a) What are the different power stages in a D.C generator?</li> <li>b) A D.C. series motor having a resistance of 1 ohm between terminals runs at a speed of 800 R.P.M. at 200 V with a current of 15 A. find the speed at which it will run when connected in series with a 5 ohm resistance taking the same current at the same supply voltage.</li> </ol>  | 07<br>08 |
| Q.3 | <ol style="list-style-type: none"> <li>a) Explain principle and operation of D.C. generator.</li> <li>b) Explain the characteristics of D.C motors.</li> </ol>   | 08<br>07 |
| Q.4 | <ol style="list-style-type: none"> <li>a) Explain speed control methods of D.C series motor.</li> <li>b) Explain the working of three point starter with neat diagram.</li> </ol>  | 08<br>07 |
| Q.5 | Write short notes (Any three) <ol style="list-style-type: none"> <li>a) Brushless D.C. motor</li> <li>b) Swinburne test</li> <li>c) Solid state starters</li> <li>d) Stepper Motor</li> </ol>  | 15       |

## Section B

- Q.6 Attempt the following (any five) 10
- A 4 pole, 50HZ Induction Motor running at 1450 rpm then what is its rotor frequency?
  - Write applications of capacitor start capacitor run single phase induction motor.
  - A 4 pole synchronous generator operating at 60 HZ then find its synchronous speed.
  - What is hunting in synchronous motor?
  - Write applications of hysteresis motor.
  - In synchronous machine which winding is called as stationary part?
  - Write applications of shaded pole single phase induction motor.
  - In an induction motor what is the condition for maximum running torque.
- Q.7
- Explain the procedure of No Load Test for induction motor. 07
  - Explain the construction and details of slip ring induction motor. Why rotor resistance is added in slip ring induction motor. 08
- Q.8
- Explain equivalent circuit of single phase induction motor and draw its equivalent circuit. 07
  - Explain any two starting methods of single phase induction motors. 08
- Q.9
- Describe construction details of synchronous machine. 08
  - Explain in detail starting methods of synchronous motor. 07
- Q.10 Write short notes (any three) 15
- AC servo motor
  - Repulsion motor
  - Principle and operation of synchronous generator.
  - Shaded pole single phase induction motor.



Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-204**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Electrical Machine & Applied Electronics**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B I. Q.No.1 from section A and Q.No.6 from section B are compulsory.  
 II. Solve any two questions from the remaining in each section.

**Section A**

- Q.1 Attempt any five 10  
 a) What are the different types of DC motors?  
 b) What are selection criteria for traction motor?  
 c) Draw the chopper circuit for speed control of DC motor.  
 d) What is regenerative braking?  
 e) Draw the construction of universal motor.  
 f) What are the advantage of electrical motor drives?  
 g) Define back EMF & state its significance.  
 h) What is synchronous speed?
- Q.2 a) Give the comparison between electric breaking and mechanical breaking. 07  
 b) Give details classification of electrical drives. 08
- Q.3 a) Explain the multi motor drive system with suitable example. 07  
 b) Draw & explain torque-slip characteristics of three phase induction motor. 08
- Q.4 a) Draw and explain 3-point states for DC motors. 07  
 b) Draw and explain construction of squirrel cage motor. 08
- Q.5 Write short notes on any three. 15  
 a) Necessity of starter in DC motor with suitable example.  
 b) Explain starters of induction motor  
 c) V/F control of AC motors  
 d) Shaded pole motor

**Section B**

- Q.6 Attempt any five 10  
 a) What is sensor and its types?  
 b) What is MOSFET?  
 c) Why sequential timer circuit is used?  
 d) Give detail classification of sensor.

- e) What is see-back effect?
  - f) What is need of buzzer and alarms?
  - g) What is solenoid valves.
  - h) What is relay? What are its types?
- Q.7      a) Give the detail classification of actuators. 07  
           b) Explain in details working principle of light dimmer circuit. 08
- Q.8      a) Differentiate MOSFET and SCR. 07  
           b) What is heat sink & explain causes and effect of heat sink? 08
- Q.9      a) Explain protection circuits in Industrial electronics. 07  
           b) What are the types of load cells? Explain construction & working. 08
- Q.10    Write short notes on any three. 15  
           a) Piezo sensors  
           b) Shaft encoder decoder  
           c) Sequential timer circuit  
           d) DIAC

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-169**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Thermodynamics – II**  
**(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 from each section A & B.
  - 2) Solve any two questions from remaining questions in each section A & B.
  - 3) Use of steam table, mollier diagram is permitted.
  - 4) Assume suitable data if required.

**Section A**

- Q.1 Solve any five. 10
- i) Write function of feedcheck valve.
  - ii) Write two difference between natural draught and forced draught boiler.
  - iii) Differentiate between convergent & divergent nozzle.
  - iv) Define nozzle efficiency.
  - v) Define boiler efficiency.
  - vi) State different heat losses in boiler.
  - vii) Define induced draught.
  - viii) Write two applications of steam.
- Q.2 10
- a) Explain La-Mont boiler 05
  - b) The following readings were obtained during a boiler trial of 6 hours duration. Mean steam pressure = 14 bar, Mass of steam generated = 40000 kg, Mean dryness fraction = 0.85, Mean feed water temperature = 30°C, Coal used = 4000 kg CV of coal=33.4 MJ/Kg. Calculate 05
    - (i) Factor of equivalent evaporation.
    - (ii) Boiler efficiency
- Q.3 07
- (a) Derive the equation for height of chimney. 08
  - (b) A boiler is equipped with a chimney of 32 metres height. The flue gases, which pass through the chimney are at temperature of 288°C, where as the atmospheric temperature is 21°C. If the air flow through the combustion chamber is 18 kg/kg of fuel burnt, find 1) The theoretical draught produced in mm of water and in height of hot gases column.
- Q.4 07
- a) Explain critical pressure ratio and maximum discharge through nozzle. 08
  - b) Dry saturated steam at a pressure of 20 bar enters a nozzle and is discharged at a pressure of 2 bar. Find the final velocity of steam, when the initial velocity of steam is negligible. If 10% of the heat drop is lost in friction, find the percentage reduction in the final velocity.

- Q.5 Write short note on (any three) 15
- Super saturated flow through nozzle
  - Benson boiler
  - Steam jet draught
  - IBR laws.

### Section B

- Q.6 Solve any five 10

- What is intercooler
- Why fins are provided on compressor cylinder.
- Limitations of Carnot cycle.
- Define swept, clearance and total volume.
- Write functions of condenser.
- Classify compressor.
- Write any two applications of compressed air.
- Why external cooler is used ?

- Q.7
- Compare jet condenser and surface condenser. 07
  - In a surface condenser, the vacuum maintained is 700mm of Hg. The barometer reads 752 mm. If the temp. of condensate is 24°C, determine- 08
    - Mass of air per kg of steam
    - Vacuum efficiency.

- Q.8
- Explain the effect of back pressure on the performance of Rankine cycle. 07
  - Steam at 50 bar, 420°C expands in a Rankie cycle to 0.30 bar. For a mass flow rate of 150 Kg/Sec., determine (1) The power developed (2) The thermal efficiency and (3) Specific Steam Consumption. 08

- Q.9
- Explain with neat diagram Axial flow compressor. 06
  - Find the percentage saving in work by compressing air in two stages from 1 bar to 8 bar instead of one stage. Assume compression index=1.38 in both the cases and optimum pressure and complete cooling in two stage compression. 09

- Q.10 Write short note on (Any three) 15
- Dalton's law of partial pressure.
  - Effect of clearance volume on reciprocating compressor.
  - Air Motor.
  - Centrifugal Compressor

Total No. of Printed Pages:2

**SUBJECT CODE NO: H-124**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**Heat Transfer**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

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

- i. Solve any three questions from each section.
- ii. Figure to the right indicate full marks.
- iii. Assume suitable data, if necessary.
- iv. Use of non-programmable calculator is allowed.

**Section A**

- Q.1 a) Derive the equation for temperature distribution, under one dimensional steady state heat conduction for plane wall. 06
- b) An exterior of wall of a house may be approximated by 0.1m layer of common brick ( $k = 0.7 \text{ W/m}^0\text{C}$ ) followed by a 0.04 layer of gypsum plaster ( $k = 0.48 \text{ W/m}^0\text{C}$ ). What thickness of loosely packed rock wool insulation  $k = 0.065\text{W/m}^0\text{C}$ ) should be added to reduce the heat loss or (gain) through the wall by 80 percent? 07
- Q.2 a) An egg with mean diameter of 40mm and initially at  $25^\circ\text{C}$  is placed in boiling water pan for 4 minutes to be boiled to the consumer's taste. For how long should a similar egg for same consumer be boiled when taken from refrigerator at  $2^\circ\text{C}$ . Take the following properties for egg:  
 $k = 12 \text{ W/m K}$ ,  $\rho = 1250 \text{ kg/m}^3$ ,  $C = 2000 \text{ J/kgK}$  and  $h = 125 \text{ W/m}^2 \text{ K}$ . Use lump theory. 07
- b) Derive the expression for critical thickness of insulation for a sphere. 06
- Q.3 a) Starting with boundary conditions, derive the expressions for temperature distribution along the length and heat flow rate for a very long fin using standard notations. 06
- b) The end of a very long cylindrical stainless steel rod is attached to a heated wall and its surface is in contact with a cold fluid. Determine by what percentage the heat removed rate would change.  
 i) If the rod diameter were doubled.  
 ii) If the rod is made up of aluminium.  
 Use  $K$  for Aluminium =  $204.7 \text{ W/m K}$ ,  $K$  for stainless steel =  $16.17 \text{ W/mK}$
- Q.4 a) Assuming that man can be represented by a cylinder 350mm in diameter and 1.65m high with a surface temperature of  $28^\circ\text{C}$ . Calculate the heat he would loss while standing in a 300 km/hr wind at  $12^\circ\text{C}$ . 07

b) Differentiate between Hydrodynamic boundary layer and thermal boundary layer. 06

Q.5 Write short notes on (any two) 14

- i) Thermal contact resistance.
- ii) Reynolds number & its significance
- iii) Grashoff numbers & its significance

### Section B

Q.6 a) Explain the difference between film and drop wise condensation. 06  
b) Draw the pool boiling curve and explain six regimes of pool boiling curve. 07

Q.7 a) Explain the shape factor algebra and silent features of the shape factor. 05  
b) For a hemispherical furnace, the flat floor is at 700K and has an emissivity of 0.5. The hemispherical roof is at 1000K and has emissivity of 0.25. Find the net radiative heat transfer from roof to floor. 08

Q.8 a) In a counter flow double pipe heat exchanger, water is heated from 25°C to 65°C by oil with a specific heat of 1.45 kJ/Kg K and mass flow rate of 0.9 kg /s. The oil is cooled 230°C to 160°C . If the overall heat transfer coefficient is 420W/m<sup>2</sup>°C, calculate the following. 07  
The rate of heat flow  
The mass flow rate of water

b) The surface area of the heat exchanger Derive LMTD for parallel flow heat exchanger. 06

Q.9 a) State and prove Kirchhoff's law. 06  
b) Two large parallel plates with  $\epsilon = 0.5$  each, are maintained at different temperatures and are exchanging heat only by radiation. Two equally large radiation shields with surface emissivity 0.05 are introduced in parallel to the plates. Find the percentage reduction in net radiative heat transfer. 07

Q.10 Write explanatory notes on : (any two) 14

- i) Classification of heat exchanger
- ii) Radiation shield
- iii) NTU Effectiveness method for counter flow heat exchanger.

Total No. of Printed Pages:3

**SUBJECT CODE NO:- H-104**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECH/PROD)**  
**Design of Machine Elements - II**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

- N.B Please check whether you have got the right question paper.
- i) Attempt any three questions from each section.
  - ii) Assume suitable data if required.
  - iii) Use of non-programmable calculator & design data book is allowed.

**Section A**

- Q.1 A pair of spur gears with  $20^\circ$  full depth involute teeth consists of a 20 teeth pinion meshing with all 14 teeth gear. The module is 3mm while the face width is 40mm. The material for pinion as well as for gear is steel with an ultimate tensile strength of  $600 \text{ N/mm}^2$ . The gears are heat treated to surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service & center for application is 1.75. Assume that velocity factor for dynamic load and factor of safety is 1.5. Determine the rated power that gears can transmit.
- Q.2 As pair of helical gears used to transmit 7.5 KW at 1440 rpm of pinion has  $20^\circ$  involute stub teeth. 13 Helix angle is  $30^\circ$  Gear ratio 4:1. Centre distance is 200mm. Material for both pinion & gear is steel having safe static stress 100 mpa & hardness of 200 BHN Design the gear. Check the design for dynamic & wear strength considerations. Given that
- $$y' = 0.175 - \left( \frac{0.841}{T_f} \right) \&$$
- $$KV = \frac{5.6}{5.6 + \sqrt{V}}$$
- C dynamic load constant =  $119 \times 10^3 \text{ N/m}$   
 Use minimum number of teeth
- Q.3 Find the power transmitted by a pair of  $20^\circ$  bevel gear with  $t_p=40$  &  $t_g=60$  teeth gears are made of 13 steel and are hardened to  $35^\circ$  BHN module is 6.5mm, width of face is 60mm but the thickness of the blanks is 35mm. Pinion rotates at 600 rpm. The shaft angle  $\alpha$  is  $90^\circ$  safe. Static stress for gears = 105 MPa. Assume  $KV = \frac{6}{6+v}$ ;  
 (for dynamic load calculation = 250 KN/m
- Q.4 A dry single plate clutch is to transmit 25 HP at 100 r.p.m. The number of springs to be used is 4 13 and ratio of mean radius of friction faces & radial width of friction faces is 1.5. Calculate
- (a) Mean radius
  - (b) Radial width of friction faces
  - (c) Dimensions of Springs. Assume mean coil diameter 6 times diameter of wire.

- Q.5 Write short note on (Any three) 13
- Centrifugal clutch
  - Formative no of teeth on Bevel gear
  - Merits and demerits of worm and worm wheel.
  - Causes of gear failure.

### Section - B

- Q.6 (a) Explain the newton law of viscosity. 04
- (b) A 75mm long full Journal bearing of diameter 75mm. Supports a load of 12 KN on a Journal 10 turning at 1800 r.p.m. Assuming at D/cd ratio of 1000 and z as  $0.01 \text{ kg/m}^3 \text{ S}$  at the operating temperature determine coefficient of friction using
- Mckee's equation
  - Raimondi & Boyd's curves

- Q.7 (a) Derive the miner's equation 05
- (b) A deep groove ball bearing has a dynamic capacity of 20200 N and is to operate on following 08 Work cycle of different radial loads

5800 N	at 200 rpm	for 25% of time
8900 N	at 500 rpm	for 20% of time
3500 N	at 400 rpm	for remaining time

Assume that the loads are steady and that the inner race rotates find the average life of bearing in hours.

- Q.8 (a) Explain slip & creep of belts. 04
- (b) A flat leather belt is used to transmit 10 KW Power from a pulley rotating at 720 r.p.m. to another pulley at 240 r.p.m. The centre distance between the pulley is twice the diameter of larger pulley. The belt should operate at a constant speed of 20m/sec approximately. The stress in the belt should not exceed  $2.5 \text{ N/mm}^2$ . The density of leather belt is  $0.98 \text{ gm/cc}$  & coefficient of friction between belt & pulley is 0.35 Belt thickness is 5mm Calculate 09
- Diameter of pulley
  - Length and width of belt
  - Belt tensions

- Q.9 Figure 01 shows a long shoe brake. Find the power absorbed and the force P, if the maximum pressure intensity is  $0.8 \text{ mpa}$ . Assume  $\mu = 0.25$ . The width of the shoe is 50mm derive the expression 13



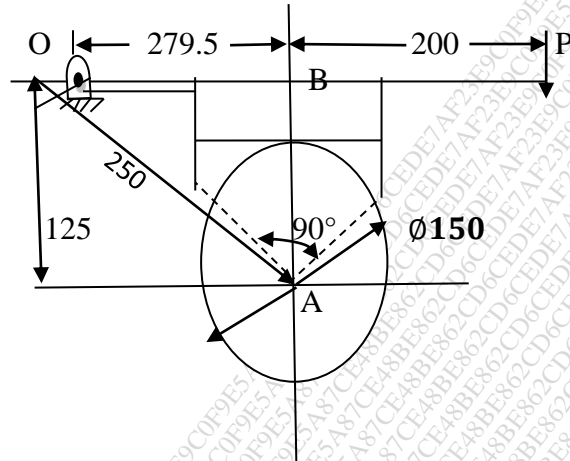


figure 01

Q10 Write Short note on (Any three)

13

- (a) Stribeck's equation
- (b) Reynold's equation
- (c) Compare V-belt, flat belt & chain drive
- (d) Petroeff equation.

Total No. of Printed Pages:06

**SUBJECT CODE NO:- H-324**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech./Prod.)**  
**Machine Drawing**  
**(OLD)**

[Time: Four Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

N.B

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

**Section A**

- Q.1 a) A cone of base 50 mm diameter and axis 60 mm long is resting on it's base on H.P. It is cut by a cutting plane perpendicular to V.P. and parallel to extreme generator and passing through a point on the axis at a distance 20mm from vertex. Draw the development of retained solid. 08
- b) A pentagonal prism side of base 30 mm, axis length 75 mm is kept on H.P. on it's base with one side of base parallel to V.P. and away to the observer. A point moves from extreme left bottom corner and reaches the extreme left top corner moving around the surface. Show shortest path traced by the point in F.V. & T.V. 08
- Q.2 Fig. No. 1 shows the incomplete front view, top view and partial auxiliary view of Bracket. Draw the given views & complete the front view & also draw left hand S.V. 12

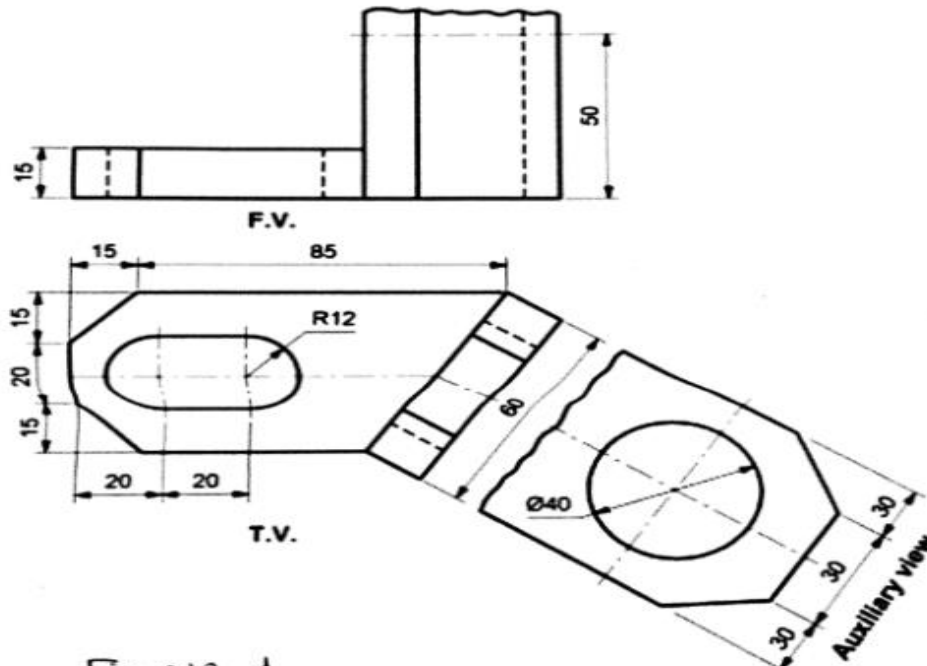


Fig. NO. 1.

OR

Fig. No. 2 shows the incomplete F.V., T.V. and partial auxiliary front view. Draw the given views and 12 complete the front view & also draw L.H. side view.

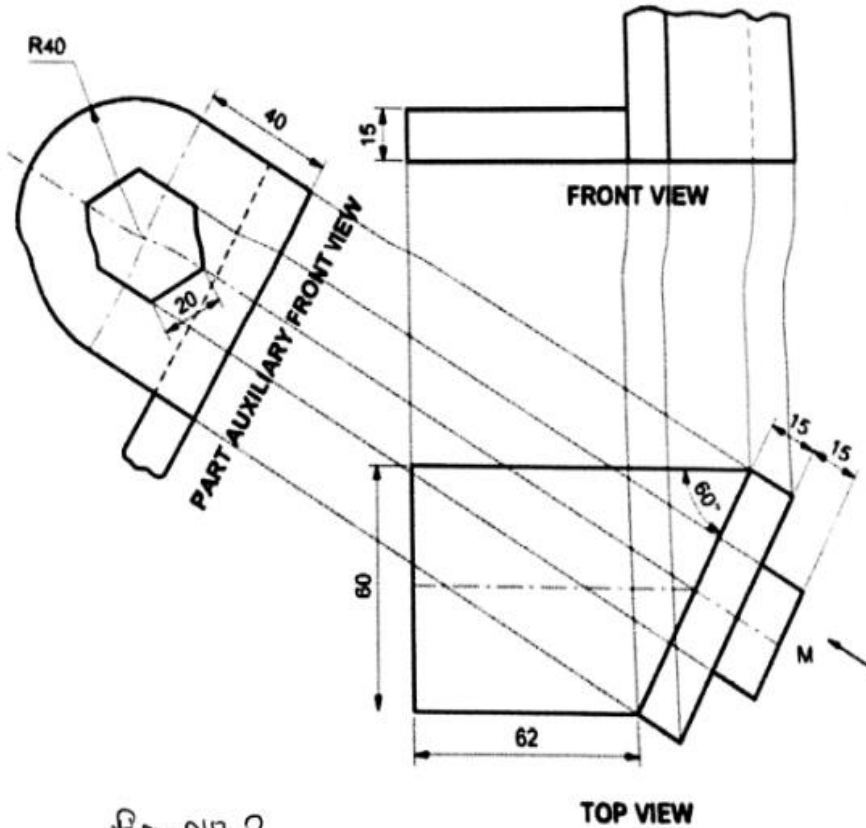


Fig. NO. 2

Q.3 A vertical cone of base diameter 100 mm and axis length 90 mm is penetrated by a Horizontal cylinder 12 of base diameter 50 mm, axis length 120 mm. The axis of the cylinder is parallel to V.P. and is 30 mm above the base of cone. The axis of cylinder is 12 mm away from the axis of cone. Draw the projection of solids showing curves of intersections.

## Section B

Q.4 Draw the conventional representation for following:

15

- i) Petrol
- ii) Bevel gear
- iii) Seam Weld
- iv) Single bevel butt weld
- v) ACME Thread Form
- vi) BSW Thread Form
- vii) Socket Joint
- viii) Pan rivet Head
- ix) Roughness grade N 7.
- x) Roughness grade N12.
- xi) Truss rivet Head
- xii) Cast Iron
- xiii) Holes on circular pitch
- xiv) Spiral spring
- xv) Roughness grade N1.

- Q.5 The details of pipe vice are shown in fig. no. 3. Draw assembly drawing as follows:-
- i) Sectional F.V.
  - ii) Left Hand side view
  - iii) Show dimension & tolerances
  - iv) prepare bill of materials.

25

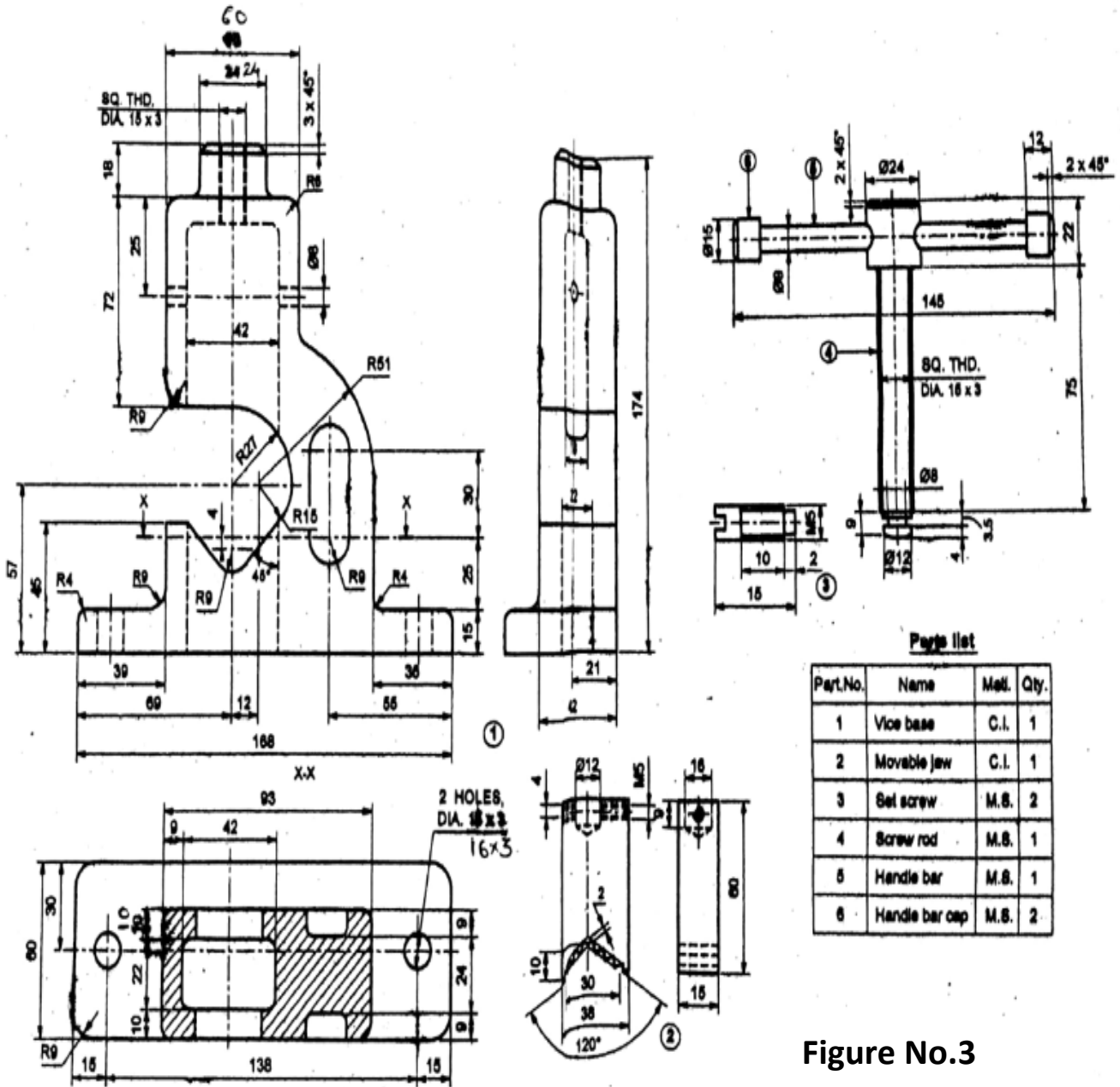


Figure No.3

OR

Fig. no. 4 show assembly drawing of steam stop valve. Draw details drawing in two views & give part 25 numbering as per list.

TOLERANCE CHART			
	+0.018		+0.011
10H7 =		30H7 =	
	+0.000		+0.000
	-0.032		+0.033
10e8 =		30e6 =	
	-0.059		+0.017
	+0.035		-0.072
82H7 =		82e8 =	
	+0.000		-0.126
	+0.021		-0.007
20H7 =		20g6 =	
	+0.000		-0.020

PART LIST			
P.NO	PART NAME	MELT	QTY.
1	BODY	C.I	1
2	VALVE SEAT	G.M	1
3	VALVE	G.M	1
4	COVER	C.I	1
5	SPINDLE	M.S.	1
6	GLAND	G.M.	1
7	NUT	M.S	1
8	HAND WHEEL	C.I	1

**FIT CHART**

10H7/e8 = CLEARANCE FIT
82H7/e8 = CLEARANCE FIT
30H7/n6 = TRANSITION FIT
20H7/g6 = CLEARANCE FIT

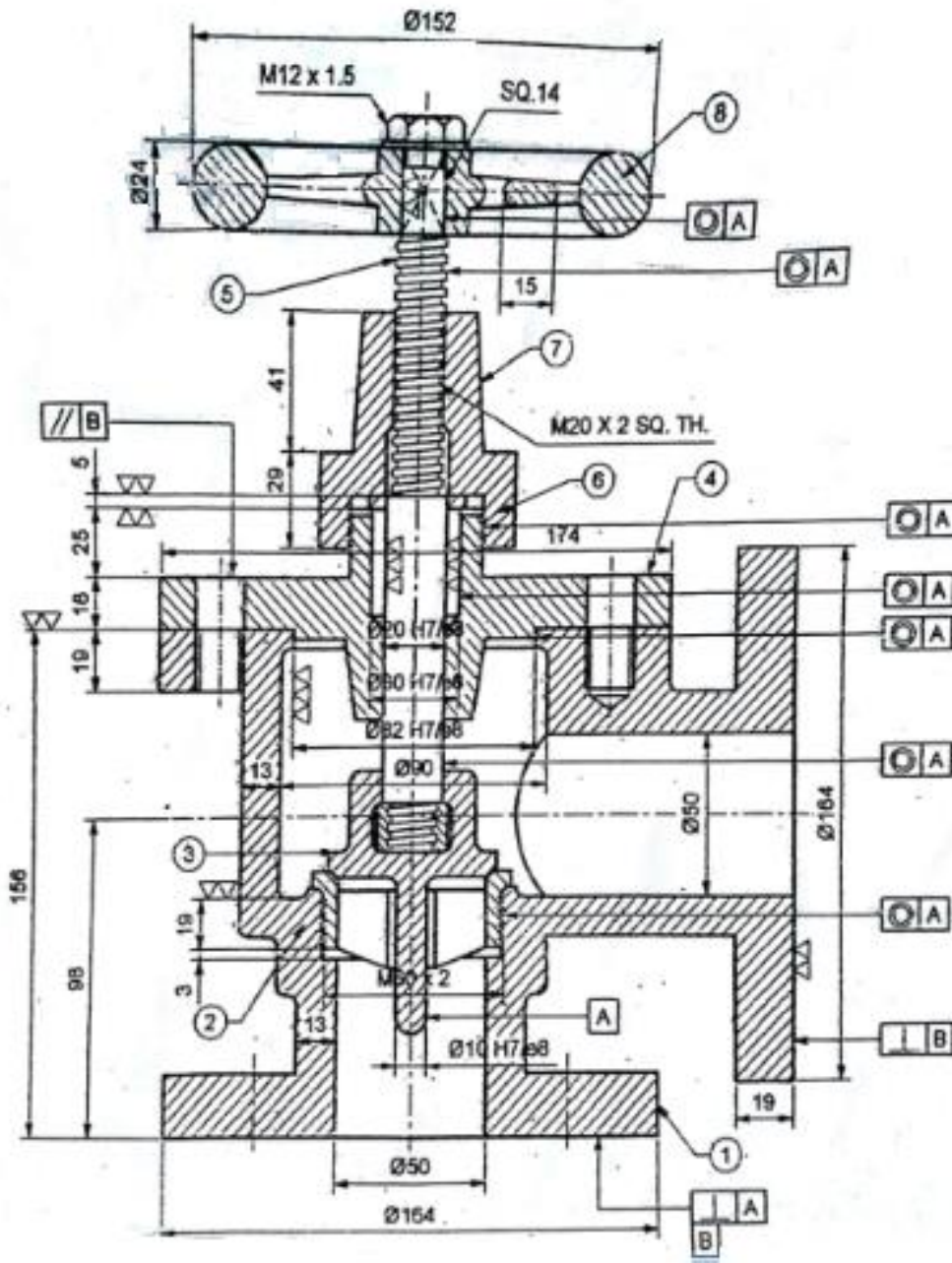


Fig. No. 4

Total No. of Printed Pages:05

**SUBJECT CODE NO:- H-325**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mechanical)**  
**Machine Drawing**  
**(REVISED)**

[Time: Four Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

N.B

- 1) Q.1 & Q.4 is compulsory.
- 2) Assume suitable data.
- 3) All dimensions are in mm.

**Section A**

Q.1 Three cut pieces of cylindrical pipes form a 'Y' Joint as given in Fig.1. Draw the development 14 of surfaces of all pieces A,B and C of 50 mm diameter.

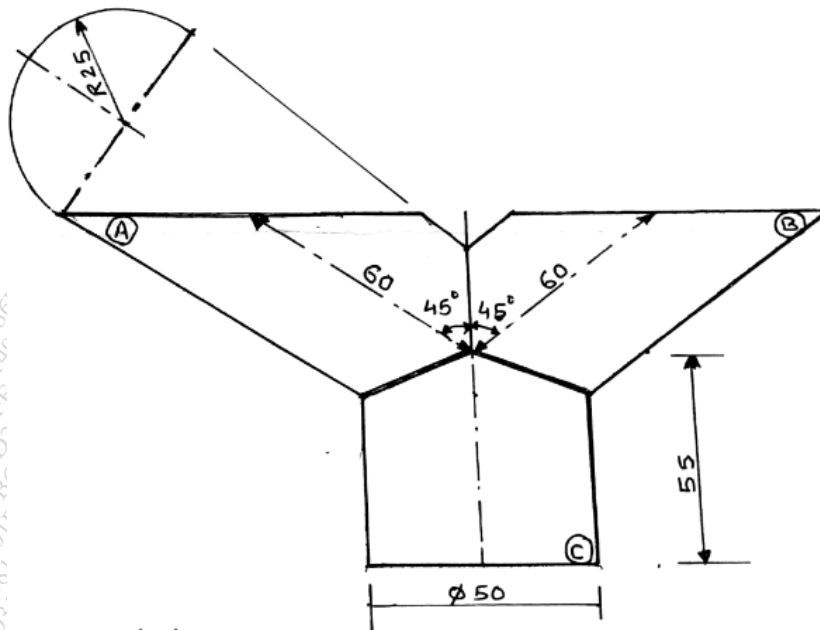


Fig 1

Q.2 A sq. prism 30 mm base sides and 70 mm axis is completely penetrated by another square prism of 25 mm sides and 70 mm axis, horizontally. Both axis intersects & bisect each other. All faces of prisms are equally inclined to V.P. Draw projections showing curves of intersection. 13

**OR**

A vertical cone, base diameter 75 mm and axis 100 mm long, is completely penetrated by a cylinder of 45 mm diameter. The axis of the cylinder is parallel to H.P. and V.P. and intersects axis of the cone at a point 28 mm above the base. Draw projection showing curves of intersection. 13



Q.3 Fig. 2 shows front view, incomplete top view and auxiliary view of an object. Redraw the front view and complete Top view showing all details.

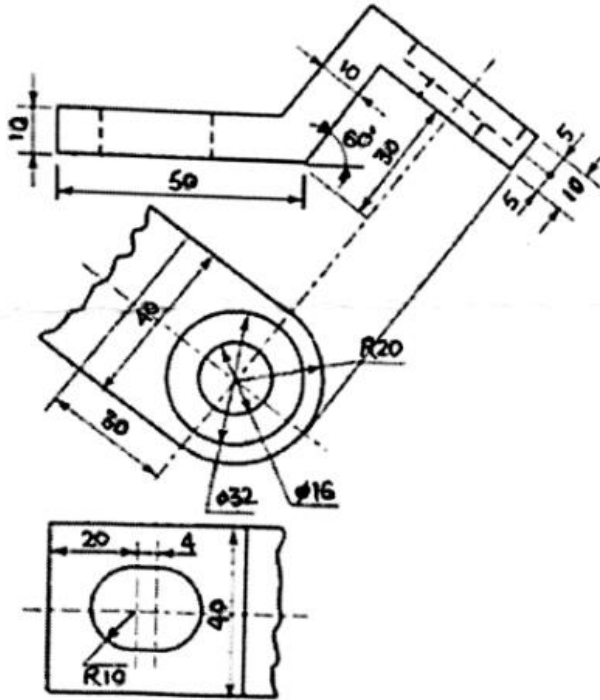


Fig.2

OR

Fig. 3 shows the top view, incomplete front view and partial auxiliary view of bracket. Draw the top view and complete the front view showing all details.

13

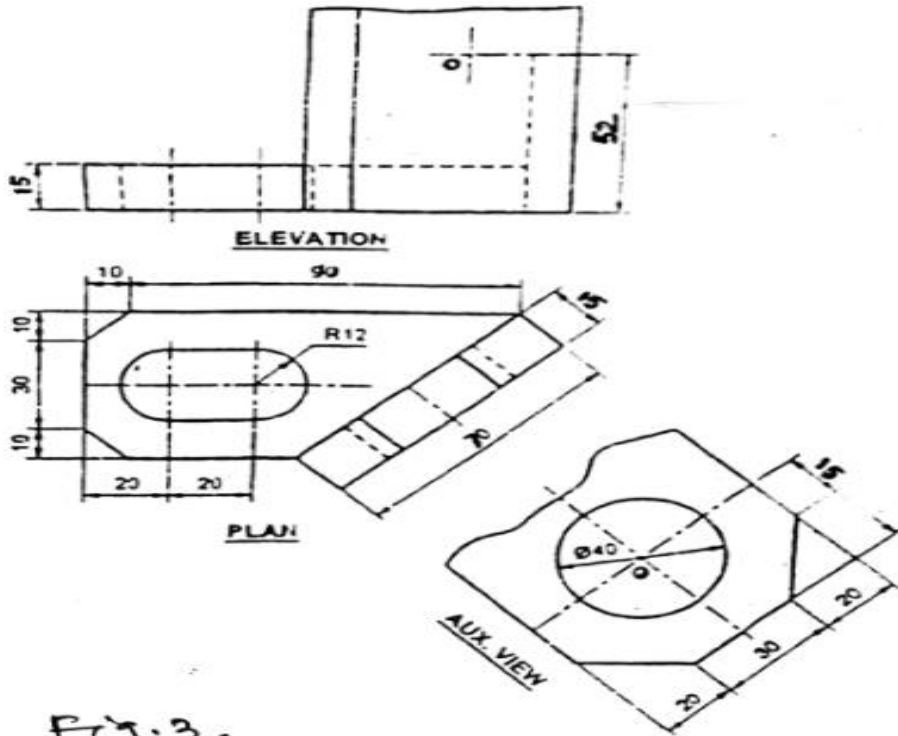
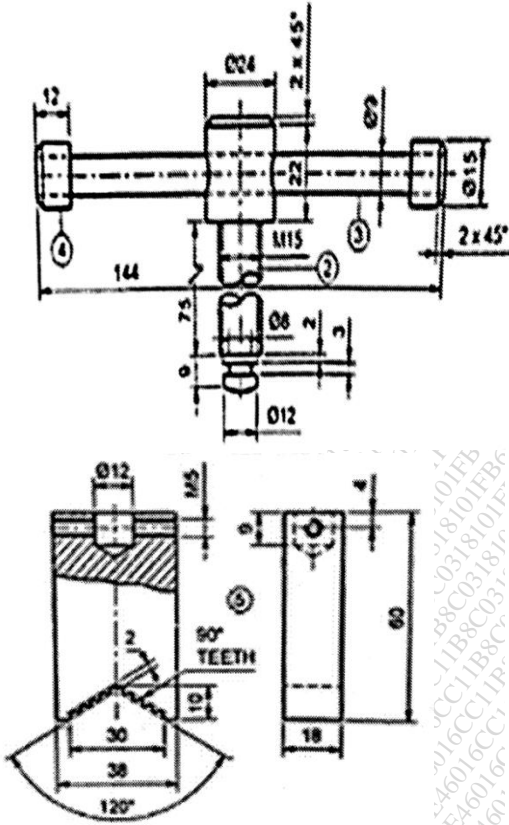


Fig. 3.

**Section B**

- Q.4 Solve any five questions from the following:
- a) Draw the conventions of following features: 03
    - i) External threads
    - ii) Diamond knurling
    - iii) Long Circular pipe with break
  - b) Draw the profile of Buttress thread showing the designing dimensions. 03
  - c) Expansion pipe joint. 03
  - d) Give the symbols of following welded joint. 03
    - i) Single Bevel Butt joint
    - ii) Plug or slot weld joint
    - ii) Single V-butt joint
  - e) Single riveted double strap butt joint. 03
  - f) Give surface roughness values and symbol for: 03
    - i) N1
    - ii) N4
    - iii) N9

Q.5 Figure 4 shows details of Pipe vice and the part list. Assemble all the parts and draw; 25  
 i) Assembled Front view ii) Top view



PART NO.	PART NAME	METL.	QTY.
1	HOUSING	C.I	1
2	HANDLE SCREW	M.S	1
3	HANDLE BAR	M.S	1
4	HANDLE BAR BUSH	M.S	2
5	JAW	C.I	1
6	SET SCREW	M.S	2

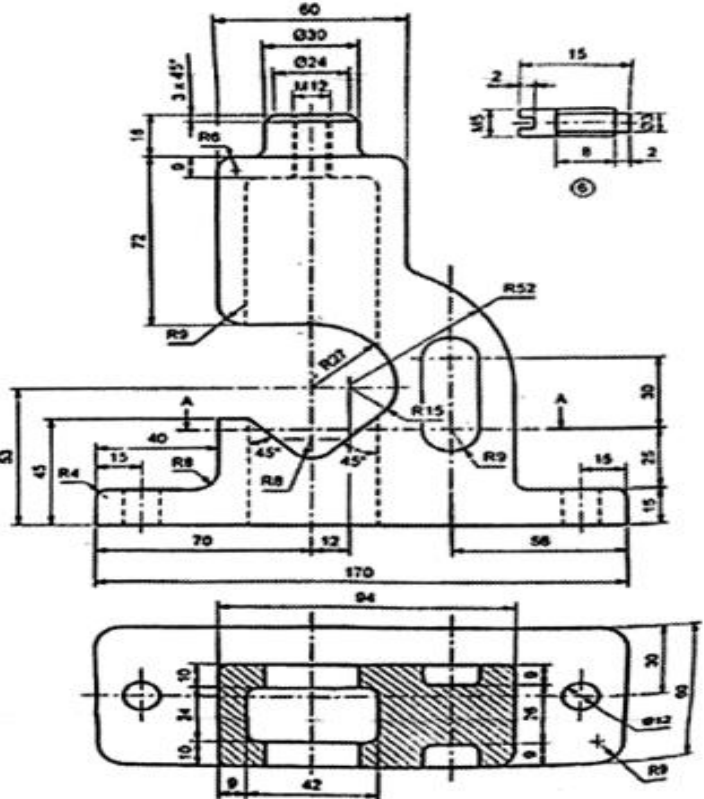
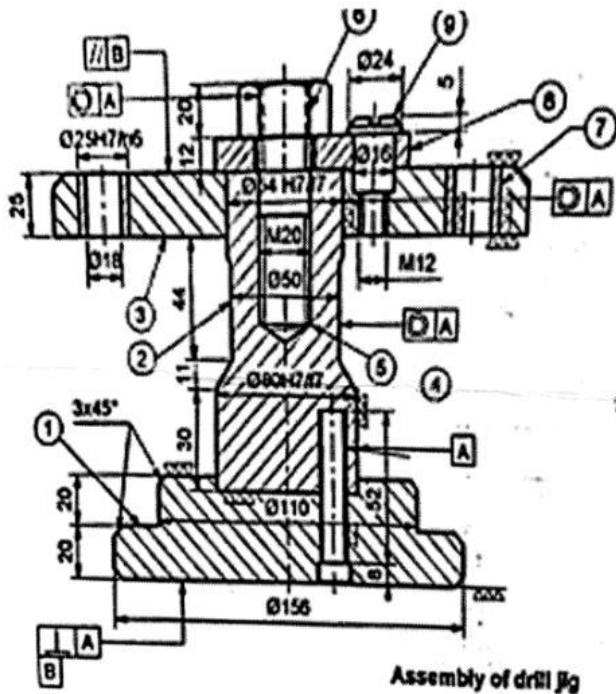


Figure 4

OR

Figure 5 shows assembly of Drill jig along with part list. Draw the details in front view and top view. 25



**FIT CHART**

25H7/n6	=TRANSITION FIT
57H7/17	=CLEARANCE FIT
60H7/17	= CLEARANCE FIT

**PART LIST**

P.NO	PART NAME	MELT	QTY.
1	BASE PLATE	C.I	1
2	STEM	M.S.	1
3	JIG PLATE	C.I	1
4	SCREW	M.S.	3
5	STUD	M.S.	1
6	NUT	M.S.	1
7	BUSH	STEEL	6
8	WASHER	M.S.	1
9	SCREW	M.S.	1

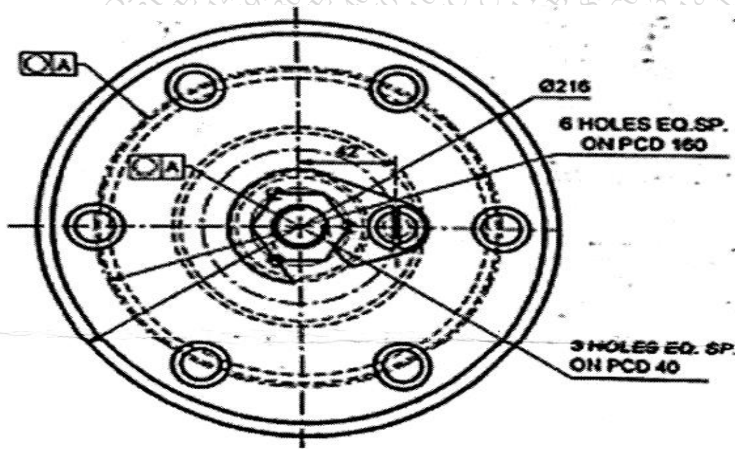


Figure 5

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-315**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECH/PROD)**  
**Metallurgy & Materials**  
**(OLD)**

[Time: Three Hours]

[Max. Marks: 80]

N.B 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 whenever required.
  - iv) Draw suitable diagram if required.

**Section A**

- Q.1 a) Explain method for finding Miller indices Also draw miller indices for plan  $[1\ 1\ 1]$ ,  $[1\ 0\ 1]$ , And  $[0\ 1\ 0]$  07
- b) What is Gibb's phase rule? Apply it on cooling curve for binary solid solution alloy. 06
- Q.2 a) Explain the method for plotting of equilibrium diagram and gives it's importance. 07
- b) Explain different invariant reaction in iron-carbon diagram. 06
- Q.3 a) What is carburizing? Is it necessary to harden and temper the components after carburizing? If yes, Why? 07
- b) How and why hardening heat treatment is to be carried out? 06
- Q.4 a) Explain martempering process 06
- b) What is meant by imperfection in crystal. Explain line defects. 07
- Q.5 Write a note on (any two) 14
- a) Critical temperature in iron-carbon diagram
  - b) Induction hardening heat treatment.
  - c) Solid solution strengthening.

## Section B

- Q.6 a) Explain the AISI method of specification of steel. 07
- b) What is Austenitic stainless steel? Explain and gives it's application 06
- Q.7 a) What is grey cast iron? Gives it's properties and application. 06
- b) What is effect of alloying elements on Fe-C 07
- Q.8 a) Write a note on Glasses and its properties and application. 06
- b) What is bronze? Explain properties and application of aluminium bronzes. 07
- Q.9 a) What is meant by composite? Explain metal matrix composite 07
- b) What are the challenges in Nano-Technology? Explain 06
- Q.10 Write a note on (any two) 14
- a) Nodular CI
- b) Properties and applications of aluminium and its alloys.
- c) Brasses.

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-304**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**I.C. Engines**  
**(REVISED)**

[Time: Three Hours]

[Max. Marks: 80]

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

- N.B
- i) Solve any three questions from each section.
  - ii) Figure to the right indicates full marks.
  - iii) Assume suitable data, if necessary.
  - iv) Use of non-programmable calculator is allowed.

**Section A**

- |     |   |    |
|-----|---|----|
| Q.1 | a) Explain with the help of P-V and T-S diagram the air standard diesel cycle. Obtain the thermal efficiency of diesel cycle in terms of compression ratio & cut off ratio. | 07 |
|     | b) Explain dissociation and its effects.  | 06 |
| Q.2 | a) In actual cycle, what is exhaust blow down loss? Explain it.   | 07 |
|     | b) Explain the principle of carburetion. State the limitations of simple carburettor.   | 06 |
| Q.3 | a) What are desirable properties of good IC engine fuels?   | 07 |
|     | b) Write the general objectives of combustion chamber for SI engine.  | 06 |
| Q.4 | a) Explain combustion in SI engine with P- $\theta$ diagram.  | 07 |
|     | b) Explain the phenomenon of detonation in SI engine with a diagram.  | 06 |
| Q.5 | Write short notes on(any two)   | 14 |
|     | 1. 'Hydrogen' as alternate fuel   |    |
|     | 2. Octane Number  |    |
|     | 3. Variable specific heat and its effect.   |    |

**Section-B**

- |     |   |    |
|-----|---|----|
| Q.6 | a) Explain different stages of combustion in CI engine with diagram.      | 07 |
|     | b) Compare knock in CI engine and SI engine.                              | 06 |
| Q.7 | a) State different combustion chamber used in CI engine. Explain any one. | 07 |
|     | b) Explain Cetane Number.   | 06 |

- Q.8 a) Mention the effect of supercharging on engine performance. What are the limitations of supercharging in an IC engine? 07
- b) A six cylinder gasoline engine operates on the four stroke cycle. The bore of each cylinder is 80 mm and stroke 100 mm the clearance volume per cylinder is 70 CC. At a speed of 4000 r.p.m., the fuel consumption is 30 kg/hr. and the torque developed is 150 N.m. calculate: 06
1. The brake power
  2. The brake mean effective pressure
  3. The brake thermal efficiency, assume the C.V. of fuel as 43,000 kJ/kg.
- Q.9 a) State different emission coming out from I.C. engine. Explain effect of any two on human health. 06
- b) Explain Homogeneous charge compression ignition Engine. Write its advantages. 07
- Q.10 Write explanatory notes on: (Any two) 14
1. Wankel engine
  2. MPFI engine
  3. Willan's line method for measuring friction power.



Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-290**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Prod.)**  
**Theory of Metal Forming**  
**(OLD)**

[Time: Three Hours]

[Max.Marks: 100]

Please check whether you have got the right question paper.

N.B

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

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) Write down von-mises & Trescas criterion for yield criterion.   | 08 |
|     | b) Explain the following terms.  | 08 |
|     | i) True stress & true strain   |    |
|     | ii) Engineering stress & strain  |    |
| Q.2 | a) A metal plate having initial dimension 20 X20 X150mm is forged to a final dimension of 10 X 40 X 150mm. coefficient of friction. Between work place & platen is 0.1, shear yield stress of metal is 55Mpa. Determine the maximum forging force. | 12 |
|     | b) Discuss recent developments in forging.   | 04 |
| Q.3 | Derive an equation for maximum workload in case of deep drawing operation.   | 16 |
| Q.4 | a) Explain the effect of temperature & strain rate on forming processes.   | 10 |
|     | b) Enlist the defects in deep drawn components.  | 06 |
| Q.5 | Write short notes on the following   | 18 |
|     | i) Slip line field theory  |    |
|     | ii) Spring back effect calculation in case of bending operation.   |    |

**Section B**

- |     |  |    |
|-----|--|----|
| Q.6 | Estimate the maximum force required for extruding a cylindrical aluminum billet of 50mm diameter & 75mm length to a final diameter of 10mm. Average tensile yield stress of material is 170N/mm <sup>2</sup> | 16 |
| Q.7 | a) Explain hydrostatic extrusion.  | 09 |
|     | b) Explain pressure distribution in rolling operation.   | 09 |

- Q.8 Derive an equation for workload in case of wire drawing operation. 16
- Q.9 a) Describe residual stresses in rod, wire and tubes. 08  
 b) Explain the defects in wire & tubes. 08
- Q.10 a) Describe the principle of lubrication, Also list various lubricants used in industrial metal working. 08  
 b) What are the major effect of friction on rolling operation? 08

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-294**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (MECH/PROD)**  
**Theory of Machines-II**  
**(OLD)**

[Time: Three Hours]

[Max.Marks:80]

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

- N.B
- i) Solve any three questions from each section.
  - ii) Assume suitable data wherever necessary.
  - iii) Use of non-programmable electronic calculator is permitted.

**Section A**

- Q.1 A) Give the comparison between involute teeth & cycloidal teeth. 05
- B) The numbers of teeth on each of the two equal spur gears in mesh are 42. The teeth have  $20^\circ$  involute profile and the module is 6mm. if the arc of contact is 1.75 times the circular pitch, find the addendum.
- Q.2 A) Define the term:- 05
- i. Pitch circle
  - ii. Circular pitch
  - iii. Module
  - iv. Path of contact
  - v. Arc of contact
- B) A pinion of 20 involute teeth & 125 mm pitch circle diameter drives a rack. The addendum of both pinion and rack is 6.25mm. What is the least pressure angle which can be used to avoid interference? With this pressure angle find-
- i. Length of the arc of contact
  - ii. Minimum number of teeth in contact at a time
- Q.3 A) Derive the expression for the height of the porter governor 06
- B) The following details refer to a proell governor with open arms. 08
- Length of all arms =200mm
  - Distance of pivot of arms from axis of rotation =40mm
  - Length of extension of lower arms to which each ball is attached=100mm
  - Mass of each ball=6kg
  - Mass of central load=150kg
- If the radius of rotation of the ball is 180mm when the arms are inclined at an angle of  $40^\circ$  to the axis of rotation. Find the equilibrium speed for the above configuration.
- Q.4 A) Explain gyroscopic effect on the aeroplane. 05
- B) Explain fluctuation of energy & fluctuation of speed in case of flywheel. 08

- Q.5 A) Explain stability of two wheel vehicle taking a turn. 06
- B) Find the angle of inclination with respect to the vertical of a two wheeler negotiating a turn, 07  
 Given: Combine mass of vehicle with rider 250kg; Moment of inertia of the engine flywheel  $0.3\text{kg}\cdot\text{m}^2$ ; Moment of inertia of each road wheel  $1\text{kg}\cdot\text{m}^2$ ; Speed of engine flywheel 5 times that of road wheels in the same direction; height of centre of gravity of rider with vehicle 0.6m; two wheeler speed 90km/h; wheel radius 300mm; radius of turn 50m.

**Section B**

- Q.6 A) Explain the different laws of friction 05
- B) A single plate clutch, effective on both sides, is required to transmit 25kw at 3000r.p.m. 08  
 Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed  $0.1\text{N}/\text{mm}^2$   
 Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear.
- Q.7 A) What do you mean by slip & creep in belt? Explain in detail. 05
- B) A leather belt is required to transmit 7.5kw from a pulley of 1.2m diameter running at 250r.p.m. The angle embraced is  $165^\circ$  and the coefficient of friction between the belt and the pulley is 0.3. The safe working stress for the leather belt is 1.5MPa, density of leather is  $1\text{Mg}/\text{m}^3$  and thickness of belt is 10mm. determine the width of the belt taking the centrifugal tension into account. 08
- Q.8 A) Define & explain – 06  
 A. Longitudinal vibration  
 B. Transverse vibration  
 C. Torsional vibration
- B) Derive the equation of motion & natural frequency for a simple pendulum using energy method. 07
- Q.9 A) Determine the undamped natural frequency of spring mass system. 08
- B) Write a short note on seismic instrument used for measurement of vibration. 05
- Q.10 Write short notes on: 04  
 A) Types of friction 05  
 B) Cone clutch 05  
 C) Chain drive 05

Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-266**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**T.E. (Mechanical)**  
**Industrial Hydraulics and Pneumatics**  
**(OLD)**

[Time: Three Hours]

[Max. Marks: 80]

N.B Please check whether you have got the right question paper.  
 i) Solve any three questions from each section  
 ii) Assume suitable data wherever necessary.

**Section A**

- Q.1 a) Draw a basic hydraulic showing various components of a circuit .Explain the function and working of each of the component 08  
 b) What are different types of hydraulic fluid used in hydraulic system. 05
- Q.2 Draw the following symbols along with it's application 13  
 i) FRL  
 ii) Solenoid operated four way three position DCV  
 iii) Hydraulic unloading valve  
 iv) Sequence valve  
 v) Pressure booster
- Q.3 a) With neat sketch explain the construction and working of a radial piston pump. 08  
 b) What is an air compressor ? What are different types of air compressor? 05
- Q.4 a) With neat sketch explain the construction and working of Lobe type compressor. 05  
 b) With a neat sketch explain the construction and working of an air filter, regulator and lubricator unit used in pneumatics. 08
- Q.5 Write a short note on (any three) 14  
 i) Laws governing the hydraulic and pneumatic system  
 ii) Gerotor pump  
 iii) Hydraulic sump  
 iv) Accumulators  
 v) Gear pump

## Section B

- Q.6 a) What is a pressure booster? With a simple circuit the use of pressure booster in a circuit. 05  
 b) What are different types of DCV? State their application by using symbolic representation 08
- Q.7 Draw the sequencing circuit for operating two double cylinder in a sequence in both strokes use appropriate component for the circuit and Explain it's working for hydraulic system. 13
- Q.8 Draw a circuit for hydraulic press where, for safety , the operator is required to engage his both the hands to operate the stroke of the press consider a double activity cylinder ,press button operated control valves and other standard components explain the working of the circuit 13
- Q.9 In a chemical plant ,an indicating lamp will be lighted when the pressure and temp rise above certain level . These two conditions are simulated by using push button switch PB1 and PB2 Draw the circuit. 13
- Q.10 Write a short note on (any three) 14  
 a) Meter in & meter out circuits  
 b) Piping in hydraulic & pneumatics  
 c) OR valve  
 d) Limits switches used in circuit  
 e) AND valve.

Total No. of Printed Pages:02

**SUBJECT CODE NO: H-275**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Machine Tools**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

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

- i. Solve any three questions from each section.
- ii. Figures to the right indicate full marks.
- iii. Add suitable sketches, wherever necessary.

**Section A**

- |     |  |    |
|-----|--|----|
| Q.1 | a) How do you define cutting speed, feed & depth of cut? State the various factors to be considered to fix these parameters. | 07 |
|     | b) Describe in brief how you measure tool life? What is machinability & machinability index?                                 | 06 |
| Q.2 | a) Discuss with neat sketch taper turning by a taper attachment.   | 08 |
|     | b) State the operations which may be performed on a lathe.   | 05 |
| Q.3 | a) Name different parts of a shaper. Describe in brief.  | 07 |
|     | b) What are the various feed mechanism in a shaper? Describe one in brief.   | 06 |
| Q.4 | a) Describe the main parts of a slotting machine. Discuss at least three of them.  | 07 |
|     | b) Describe how a gear can be produced using a formed disc cutter?   | 06 |
| Q.5 | Write short note on the following  | 14 |
|     | i) Work holding devices in lathe   |    |
|     | ii) Single point cutting tool nomenclature   |    |

**Section B**

- |     |  |    |
|-----|--|----|
| Q.6 | a) Sketch and describe in brief a radial drilling machine. | 09 |
|     | b) Draw neat sketch of twist drill. (two views)            | 04 |

- Q.7 a) Describe in brief the different operations that can be performed on a horizontal boring machine. 07
- b) Write short note on work holding devices in drilling machine. 06
- Q.8 a) What is the function of bonds in grinding wheel? Indicate bonding materials & name their corresponding grinding wheel. 07
- b) Describe grit, grade & structure of grinding wheel. 06
- Q.9 a) With neat sketch explain electro discharge machining. 07
- b) Explain ultrasonic machining process. 07
- Q.10 a) State general lubrication practice. How lubricants are selected for machine tool? 06
- b) Explain preventive, breakdown maintenance system. 07



Total No. of Printed Pages:02

**SUBJECT CODE NO:- H-276**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**S.E. (Mech/Prod)**  
**Production Processes-II**  
**(OLD)**

[Time: Three Hours]

[Max. Marks: 80]

- N.B Please check whether you have got the right question paper.
- i) Question No. 1 from section A and Q. No.6 from section B are compulsory.
  - ii) Attempt any two questions from Q. No 2 to Q. No 5 in section A and any two questions from Q. No 7 to Q. No 10 in section B.
  - iii) Assume suitable data whenever necessary.

**Section A**

- |     |   |          |
|-----|---|----------|
| Q.1 | Attempt any five questions from the following:-   | 10       |
|     | <ol style="list-style-type: none"> <li>a) What are the types of chips?</li> <li>b) What are the various materials used for cutting tools?</li> <li>c) What is machinability?</li> <li>d) Explain economics of machining.</li> <li>e) Enlist Lathe Accessories.</li> <li>f) Explain Live centre and Dead centre in Lathe machine.</li> <li>g) Enlist work holding devices for milling machine.</li> <li>h) What are the applications of universal dividing head.</li> <li>i) What is CIM?</li> <li>j) What is Gear Hobbing?</li> </ol> |          |
| Q.2 | <ol style="list-style-type: none"> <li>a) What is orthogonal and oblique cutting?</li> <li>b) Explain heat generated in machining.</li> </ol>   | 08<br>07 |
| Q.3 | <ol style="list-style-type: none"> <li>a) What is the effect of cutting speed, feed and depth of cut on tool life in machining process?</li> <li>b) Enlist workholding devices for Lathe Machine .Explain any two with neat sketches.</li> </ol>  | 08<br>07 |
| Q.4 | <ol style="list-style-type: none"> <li>a) What are the various Lathe Attachments?</li> <li>b) With neat sketch , explain universal milling machine.</li> </ol>  | 08<br>07 |
| Q.5 | <ol style="list-style-type: none"> <li>a) Enlist tool holding devices for milling machine .Explain any two with neat sketches.</li> <li>b) What are the various operations performed on milling machine?</li> </ol>   | 08<br>07 |

## Section B

- Q.6 Attempt any five questions from the following:- 10
- What are the various types of slotter?
  - Enlist work holding devices for drilling machine.
  - What is grade and structure of grinding wheel?
  - What are boring bars?
  - What are the limitations of broaches?
  - What is the need of Non-Traditional Machining?
  - What are the classification of non-traditional machining processes?
  - What is Electron Beam machining?
  - Enlist boring defects.
  - Enlist tool holding devices for shaper machine.
- Q.7 a) What are the various workpiece holding devices for shaper machine. Explain any two with neat sketches. 08
- b) Explain the principle & working of slotter machine. 07
- Q.8 a) With neat sketch explain sensitive drilling machine .Give its applications. 08
- b) What is the classification of boring machine? Explain any one. 07
- Q.9 a) Explain push and pull type broach. 08
- b) What is dressing and trueing of grinding wheel ? When it is to be done? 07
- Q.10 a) What are the advantages , limitations and applications of Laser Beam machining process? 08
- b) With neat sketch explain Electro chemical machining. 07

Total No. of Printed Pages:3

**SUBJECT CODE NO:- H-182**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.E. (Mechanical)**  
**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 three questions from each section.
  2. Figure to the right indicate full marks.
  3. Use of refrigerant table, steam tables & psychometric chart is allowed.

**Section A**

- Q.1 a) Explain the Ton of refrigeration. Differentiate between refrigerator & heat pump. 06
- b) Explain Reversed Carnot cycle for refrigeration. 07
- Q.2 a) A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is  $42^{\circ}\text{C}$  and lower temperature is  $-17^{\circ}\text{C}$ . The capacity of the machine is 15 tonnes. Neglecting all losses find coefficient of performance. 06
- i) Heat rejected from the system per hour.
  - ii) Power required for driving the machine.
- b) A reversed Carnot cycle working as a heat pump is delivering 6000 KJ/ min to heat the conditioned space & maintain it at  $27^{\circ}\text{C}$  when the atmospheric temp. is  $17^{\circ}\text{C}$ . Determine heat transfer in the conditioned space from atmosphere & power required to operate the cycle. 07
- Q.3 The following data refer to a two stage compression ammonia refrigerating system with water intercooler. 13
- Condenser pressure = 14 bar,  
 Evaporator pressure = 2 bar,  
 Intercooler pressure = 5 bar,  
 Load on the evaporator = 3 TR.
- If the temperature of the de-superheated vapour & sub-cooled liquid refrigerant are limited to  $32^{\circ}\text{C}$ , find.
- i) The power required to drive the system
  - ii) C.O.P of the system
  - iii) The swept volume of compressor if the volumetric efficiency of the compressor is 80%.

- Q.4 An aircraft moving with speed of 1000km/hr uses simple gas refrigeration cycle for air-conditioning. 13  
The ambient pressure & temperature are 0.35 bar &  $-10^{\circ}\text{C}$  respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor & expander are 80% each. The cabin pressure & temperature are 1.06 bar &  $25^{\circ}\text{C}$ . Determine temp & pressure at all points of cycle. Find the volume flow rate through compressor inlet & expander outlet for 100 TR. Take,  $C_p = 1.005 \text{ KJ/Kg.K}$   
 $R = 0.287 \text{ KJ/Kg.K}$   
 $\frac{c_p}{c_v} = 1.4$  for air
- Q.5 Write short note on the following (any three) 14
- Limitation of simple VCC
  - Multi-evaporator system with multiple expansion valve.
  - Necessity of air-craft refrigeration.
  - Methods to improve COP of VCC
  - Two-stage compression with water intercooler.

### Section B

- Q.6 a) Advantages of vapour absorption refrigeration system over vapour compression refrigeration 07  
system.
- b) Thermodynamic requirements of refrigerant-absorbent mixture. 06
- Q.7 a) What is secondary refrigerant? Write desirable properties of ideal refrigerant. 06
- b) Write down designation of following refrigerants. 07
- Ammonia,
  - Dichloro –difluoro methane
  - Dichloro –tetrafluoro ethane
  - Dichloro –mono-fluoro- methane
- Q.8 a) The reading from a sling psychrometer are,  $DBT = 30^{\circ}\text{C}$ ,  $WBT = 20^{\circ}\text{C}$ ,  
Barometer reading = 740 mm of Hg. Using steam table determine, 07
- Dew point temp.
  - Degree of saturation,
  - Vapour density
  - Specific humidity
  - Enthalpy of mixture per kg of dry air.
- b) Describe psychrometric chart with all the lines which play an important role in chart. 06

Q.9 An air-conditioning plant is to be designed for a small office for winter conditions with the following data. 13

*Outside conditions = 10°C DBT, 8°C WBT, Required indoor conditions = 20°C DBT & 60% Relative humidity.*

Amount of air circulation = 0.3 m<sup>3</sup>/ min/ person.

Seating capacity of the office = 50 persons. The required condition is achieved first by heating & then by adiabatic humidifying.

Find:

- i) Heating capacity of the coil in KW and the surface temp. If the by-pass factor of the coil is 0.32.
- ii) Capacity of the humidifier.

Q.10 Write a short note on (any three)

- i) Winter air conditioning
- ii) Window air conditioning
- iii) Room sensible heat factor
- iv) ODP & GWP
- v) Secondary refrigerant

14