

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]

- N.B Please check whether you have got the right question paper.
- 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 contains both elements, those of science and art.' Comment | 07 |
| | b) Enlist the principles of management. Explain any two in detail? | 06 |
| Q.2 | a) Enlist Crosby's 14 points of TQM. Explain any one in detail? | 07 |
| | b) Explain the process of knowledge Management? | 06 |
| Q.3 | a) Explain committee organization with its advantages and disadvantages? | 07 |
| | b) Explain the advantages and disadvantages of co-operative organisation? | 06 |
| Q.4 | a) Explain the process of selection and induction in an organization? | 07 |
| | b) Explain Job analysis and discuss any one of its types? | 06 |
| Q.5 | Write short notes on any three:- | |
| | a) Steps in implementing TQM | 05 |
| | b) Management of change | 05 |
| | c) Joint stock company | 04 |
| | d) Functions of Trade Union | 04 |
| | e) Retirement/separation and its types | 04 |

Section B

- | | | |
|-----|---|----|
| Q.6 | a) A manufacturing company produces 200 units of a certain product. The direct Material cost is Rs2, 800/- and direct labour cost is Rs.4, 000/-. The administration, Distribution and selling overheads are 4%, 6% and 8% of factory cost respectively. The factory overheads are 40% of prime cost. Determine the prime cost per product to obtain a profit of 10%? | 07 |
| | b) Discuss the various costs associated with inventory with the help of a diagram? | 06 |
| Q.7 | a) Derive the expression of EOQ? Mention the detail of each notation used? | 07 |
| | b) Enlist types of elasticity of supply. Explain any two with the help of diagram? | 06 |

- Q.8 a) A CNC machine costs Rs.25, 00,000/- and is estimated to serve for 6 years after which its salvage value is estimated to be Rs.2, 50,000/-. Find depreciation fund at the end of the 3rd year by straight –line method? 07
- b) What is the scope and significance of financial management? 06
- Q.9 a) What are the various kinds of economic decisions? 07
- b) Explain payback period method with the help of suitable example? 06
- Q.10 Write short notes on any three:-
- a) ABC Analysis. 05
- b) Economic principles for management decision. 05
- c) Micro and Macro Economic Analysis. 04
- d) Profitability index & IIR method. 04
- e) Types of depreciation. 04

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]

Please check whether you have got the right question paper.

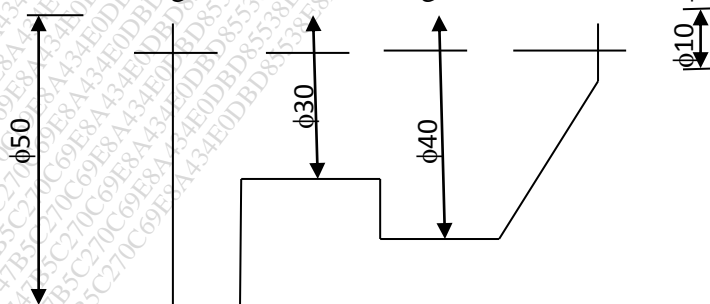
- N.B
1. Solve three questions from each section.
 2. Figure to the right indicate full marks.

Section A

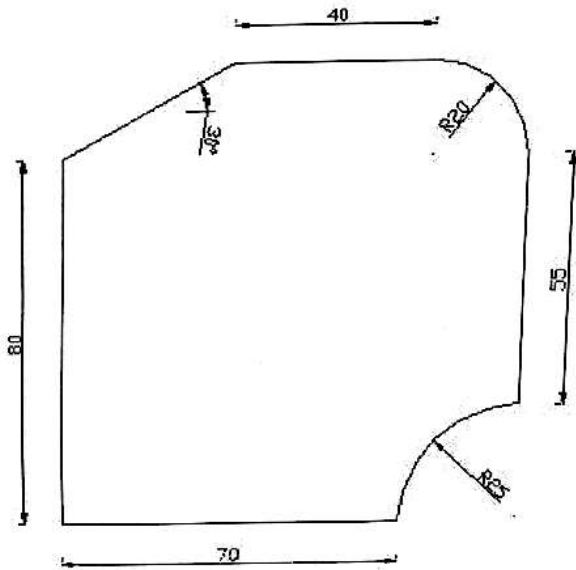
- | | | |
|-----|--|----------|
| Q.1 | Discuss in detail the conventional product life cycle with help of neat block diagram. | 13 |
| Q.2 | a. Manufacturing database establishes a link between CAD and CAM. Justify.
b. Explain the basic design process with help of a block diagram. | 06
07 |
| Q.3 | A triangle is defined in 2D space by its end points P(2,1), Q(6,1), R(2,6). Express them in matrix notation and perform the following transformations and show it graphically.
1) Scale it by a factor of 1.5
2) Rotate it by 90° about origin | 13 |
| Q.4 | a. Explain various Boolean operations used in 3D modeling
b. Compare CSG technique against B-rep technique of solid modeling | 07
06 |
| Q.5 | Write short note (Attempt any three)
a. Engineering analysis function of CAD.
b. Wire frame and solid modeling
c. Bezier curves
d. Concurrent Engineering | 14 |

Section B

- | | | |
|-----|---|----------|
| Q.6 | a. Explain various formats used for preparing part program manuscript with suitable example.
b. Write a manual part program manuscript for turning the component shown in fig. on CNC lathe machine using suitable machining data. Stock size is $\phi 52$ mm. | 05
08 |
|-----|---|----------|



Q.7 Write a APT program for profile milling the part shown in fig. using suitable machining data 13



Q.8 a. Define direct and in-direct kinematics and differentiate between them. 06
 b. Explain the different types of sensors used in robot using examples 07

Q.9 a. Describe the technique of group technology. 07
 b. Discuss the applications of computer for material requirement planning. 06

Q.10 Write short note (Attempt any three) 14
 a. CAQC
 b. NC co-ordinates and axes
 c. DNC
 d. Canned cycles

Total No. of Printed Pages:2

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

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Solve any three questions from each section.
 - ii) Figures to the right indicate full marks.
 - iii) Assume suitable data if required.
 - iv) Use of heat & mass transfer data book & Non programmable Calculator is permitted.

Section -A

- Q.1 a) Derive the equation for temperature distribution and heat transfer rate under one dimensional steady state heat conduction, for plane wall (for Uniform thermal conductivity) 06
- b) A wall of furnace is made up of inside layer of silica brick 120mm thick covered with a layer of magnesite brick 240mm thick. The temp at the Inside the surface of the silica brick wall and outside surface of magnesite brick walls are 725°C & 110°C respectively. The contact thermal resistance between two walls at the interference is 0.0035°C/W per unit wall area. If $K_{\text{silica}} = 1.7 \text{ W/m}^\circ\text{C}$ & $K_{\text{magnesite}} = 5.8 \text{ W/m}^\circ\text{C}$. Calculate. 07
- (i) The rate of heat loss per unit area of walls &
 - (ii) The temperature drop at the interference
- Q.2 a) Differentiate between effectiveness & efficiency of heat transfer of extended surface? 06
- b) A mercury thermometer placed in oil well is required to measure temp of compressed air flowing in a pipe. The well is 140mm long and made up of steel ($K=50\text{W/m}^\circ\text{C}$) of 1mm thick. The temp recorded by the well is 100°C. While the pipe wall temp is 50°C. Heat transfer coefficient between the air & well wall is $30 \text{ W/m}^2 \text{ }^\circ\text{C}$. Estimate true temp. of air? 07
- Q.3 Derive an energy equation for thermal boundary layer over flat plate? 13
- Q.4 a) Define Nusselt Number & Prandtl number? 06
- b) A vertical cylinder 1.5m high & 180 mm in dia is maintained at 100°C in an atmosphere environment of 20°C. Calculate heat loss by free convection from the surface of the cylinder. Assume properties of air at mean temperature as, $\rho = 1.06 \text{ kg/m}^3$, $V = 18.97 \times 10^{-6} \text{ m}^2/\text{s}$, $C_p = 1.004 \text{ KJ/kg}^\circ\text{C}$ and $K = 0.1042 \text{ KJ/mh}^\circ\text{C}$. 07
- Q.5 Write any two (Short Notes) 14
- (1) Critical thickness of Insulation
 - (2) Boundary layer thickness
 - (3) Thermometer Well

Section – B

- Q.6 a) Draw the pool boiling curve & explain six regimes of pool boiling curve? 07
 b) Write a note on critical heat flux in boiling curve? 06
- Q.7 a) State and explain Wien's displacement law. 05
 b) Define explain 08
 (1) Black body
 (2) Irradiation
 (3) Diffused radiation
 (4) Opaque body
- Q.8 Derive an expression of LMTD of a center flow heat exchanger stating the assumptions made. 13
- Q.9 It is required to design the shell & tube heat exchanger for heating 2.4 kg/s of H₂O from 20°C to 90°C by a hot engine oil (C_p=2.4 KJ/Kg°C) following through the shell of the H.E. The oil makes a single pass entering at 145° C & leaving at 90°C with an average heat transfer coefficient of 380W/m²°C. The water flows through '12' thin walled tube of 25mm dia. With each tube making '8' passes thro shell. The heat transfer coefficient on water side is 2900 W/m²°C. Calculate the length of the tube required for H.E. to accomplish the required water heating. 13
- Q.10 Write any two (Short Notes) 14
 (1) Radiation Shield
 (2) Shape Factor
 (3) Types of heat exchanger's

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-104
FACULTY OF SCIENCE & 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 necessary.
 iii) Use of non-programmable calculator and design data book is allowed.
- Section – A
- Q.1 A speed reducer unit is to be designed for an input of 2.1 kW with a transmission ratio 30. The speed of the hardened steel worm is 1490 r.p.m. The worm wheel is to be made of phosphor bronze. The tooth form is to be 20° involute. 13
- Q.2 It is required to design a spur gear drive containing pair of spur gears having 20° involute full depth teeth for transmitting 16 kW. The pinion rotates at 275rpm & the velocity ratio is 1:4. The allowable static stresses for gear & pinion is materials are 120 & 140 Mpa respectively. Consider the number of teeth on pinion is 18. 13
- Q.3 A helical gear with 23° helix angle is to transmit 2.5 kW at 10000 rpm of pinion. The gear ratio is 4. Both gears of hardened steel with allowable bending stress of 100 Mpa. The gears are 20° stub & number of teeth on the pinion=24. Determine pitch circle diameters of the gears & required BHN. Data: $S_{es} = 480\text{Mpa}$, Dynamic load constant = 119 kN/m, $K_v = \frac{5.6}{5.6 + \sqrt{v}}$. Check the design. 13
- Q.4 A multiple disc neat clutch, consists of steel & bronze plates transmitting 14kW at 1400 rpm. The inner & outer diameter of disk being 130 mm & 190 mm respectively. The engagement factor is 1.4. The coefficient of friction between contracting plates is 0.16 & maximum intensity of pressure is 0.25 Mpa. Using uniform wear & uniform pressure conditions, find out the required number of steel & bronze plates. 13
- Q.5 Write short notes on (any three) 14
- i) Merits & Demerits of worm & Worm wheel.
 - ii) Causes of gear failure
 - iii) Formative no. of teeth on Bevel gear.
 - iv) Design procedure for cone clutch.
- Section-B
- Q.6 A V belt drive transmits 12 KW at 1000rpm of the smaller pulley. The pitch diameters are 125 mm and 350 mm. If the maximum force per belt is 600N. Determine the no of belts required. It the coefficient of friction is 0.2 and the groove angle of the pulley is 34. The belt mass is 200 gram/meter. 13

- Q.7 A sleeve bearing with length = 50mm & $L/D = 1$, carries a radial load of 4.5kN at 3600 rpm. The oil used is having viscosity of 15×10^{-3} pas. If $h_0/c = 0.8$. Calculate the radial clearance, heat lost, the side flow, the minimum film thickness & rise in temperature of oil. 13
- Q.8 Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1595 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load. 13
- Q.9 In a band and block brake, the band is lined with 14 blocks, each subtending an angle of 15° at the centre. Find out the least force required for the brake to absorb 245kW at 250 rpm. Take $\mu = 0.4$ lengths of pins on either side of fulcrum=150 mm and 30 mm respectively and length of lower 500 mm. Consider brake drum diameter as 850 mm and thickness of each block as 75 mm. 13
- Q.10 Write short notes on (Any three) 14
- Heat dissipation in Brakes.
 - Compare sliding & rolling contact bearings.
 - Slip & Creep of belt.
 - Rope drive

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]

Please check whether you have got the right question paper.

- N.B
- i) Solve any three questions from each section.
 - ii) Assume suitable data, if necessary.

SECTION A

- Q.1 a) Draw a basic hydraulic circuit showing various components of a circuit, explain the function and working of each component. 09
 b) State the pascal's law and write Bernoulli's equation. 04
- Q.2 a) Why symbols are used in hydraulic and pneumatic system? What are the different standards used in symbol. 05
 b) Draw symbol for following: 08
 i) Sequence valve
 ii) Pressure Booster
 iii) Pneumatic unidirectional motor
 iv) Push bottom operated 4/3 DCV
- Q.3 a) With a neat sketch, explain the construction and functions of hydraulic oil reservoir. 07
 b) With a neat sketch, explain construction and working of a vane type of compressor. 06
- Q.4 a) Explain the construction and working of radial piston pump with a neat sketch. 07
 b) With a neat sketch, explain construction and working of Gerotor. 06
- Q.5 Write short note on any three 14
 i) Properties of oil used in hydraulic system
 ii) Air reservoir
 iii) Accumulator
 iv) Couplings
 v) Hydraulic motor

SECTION – B

- Q.6 a) Explain the construction and working of pressure reducing valve with a neat sketch. 09
 b) Enlist the types of flow control valve and its function. 04
- Q.7 a) Explain and compare pressure line filter and return line filter with the help of neat sketch. 07
 b) Explain the construction and working of double acting cylinder actuator with neat sketch. 06
- Q.8 Explain meter in and meter out speed control circuit with a neat sketch and suitable example. 13

Q.9 What is programmable logic controller? How it is used in electro-hydraulic and electro-pneumatic system? State its advantages and limitations. 13

Q.10 Write short note on any three: 14

- i) Pneumatic breaking system
- ii) Counter balance circuit
- iii) Quick exhaust valve
- iv) Pressure switches
- v) Ladder diagram

Total No. of Printed Pages:3

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

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

N. B

1. Solve any three questions from each section.
2. Assume suitable data whenever necessary.

Section A

- Q. 1 a) Derive an expression for the length of path of contact in a pair of meshed spur gears. 05
- b) Two mating involute spur gear of 20° pressure angle have a gear ratio of 2. the number of teeth on the pinion is 20 and it's speed is 250 r.p.m. the module pitch of the teeth is 12mm. if the Addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length find (1) The addendum for pinion and gear wheel. 2) the length of path of contact and length of the arc of contact. Assume pinion to be the driver. 08
- Q. 2 a) Derive an expression of spiral gear efficiency. 06
- b) A right angled drive on a machine is to be made by two spiral wheels. The wheels are of equal diameter with a normal pitch of 10 mm and the center distance is approximate 150 mm. If the speed ratio of 2.5 to 1. Find
- 1) The spiral angles of the teeth.
 - 2) The number of teeth on each wheel.
 - 3) The exact center distance.
 - 4) The maximum efficiency, if the friction angle is 6° .
- Q. 3 a) Draw and explain turning moment diagram of a single cylinder double acting steam engine. 05
- b) A porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 50 kg. The extreme radii of rotation are 150 mm and 220 mm. determine the range of speed of the governor. 08
- Q. 4 a) Explain gyroscopic effect on ship during steering, pitching and rolling. 06
- b) A four wheel trolley car of total mass 2000 kg running on rails 1m gauge. Rounds a curve of 25m radius at 40km/hr. The track is banked at 10° the wheels have an external diameter of 0.6 m and each pair of an axle has a mass of 200 kg. the radius of gyration for each pair is 250 mm. The height of C. G. of the car above the wheel base is 0.95 m. Allowing for centrifugal force and gyroscopic couple action, determine the pressure on each rail. 07

- Q. 5 Write short notes on
- 1) Hartnell governor 05
 - 2) Types of gear train 04
 - 3) Coefficient of fluctuation of energy and coefficient of fluctuation of speed. 05

Section – B

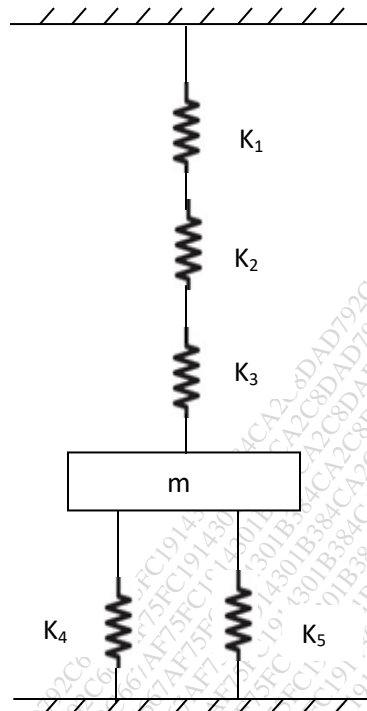
- Q. 6
- a) Explain with neat sketch Multiplate clutch. 05
 - b) A single dry plate clutch transmits 7.5 kw at 900 r.p.m. The axial pressure is limited to 0.07N/mm^2 . If the coefficient of friction is 0.25, find
 - i) mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4
 - ii) outer and inner radii of the clutch plate. 08

- Q. 7
- a) Derive an expression for the length of a cross belt drive. 05
 - b) The reduction of speed from 360 r.p.m to 120 r. pm is desired by the use of chain drive. The driving sprocket has 10 teeth. Find the number of teeth on the driven sprocket. If the pitch radius of the driven sprocket is 250 mm and the center to center distance between the two sprockets is 400 mm, find the pitch and length of the chain. 08

- Q. 8
- a) Define and explain
 - i) Longitudinal vibration 06
 - ii) Transverse vibration
 - iii) Torsional vibration 07
 - b) For the given system shown in fig

$K_1 = 3000\text{N/m}$, $K_2 = 1500\text{ N/m}$
 $K_3 = 2000\text{N/m}$, $K_4 = K_5 = 500\text{ N/m}$

find mass 'm'such that system has natural frequency of 10 Hz .



- Q. 9
- a) Define viscous damping, logarithmic decrement and damping factor. 06
 - b) The measurement on a mechanical vibrating system show that it has a mass of 8 kg and that spring can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40N when the mass has a velocity of 1 m/s. Find
 - i) Critical damping coefficient
 - ii) Damping factor
 - iii) Logarithmic decrement
 - iv) Ratio of two consecutive amplitudes

- Q. 10 Write a short note on
- i) Magnification factor 04
 - ii) Transmissibility 04
 - iii) Slip and creep in belt drive 06

Total No. of Printed Pages: 01

SUBJECT CODE NO:- H-315
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (Mech/Prod)
Metallurgy & Materials
(Old)

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

N. B

1) Solve Any three questions from each Section.

Section A

- | | | |
|------|--|----|
| Q. 1 | a) Describe the various imperfections in crystals. Explain any one. | 07 |
| | b) What is miller indices? With example explain how to determine miller indices. | 07 |
| Q. 2 | a) Draw and label Iron-Iron carbide diagram. Explain different phases in it. | 07 |
| | b) What is lever rule? Describe its importance with suitable example. | 06 |
| Q. 3 | a) How "TTT curves" determined for a given steel? Explain. | 07 |
| | b) Distinguish between Annealing & Normalizing. | 06 |
| Q. 4 | a) Explain Jominy end quench test for determining the hardenability of steel. | 07 |
| | b) What is nitriding? Explain the process of nitriding of steel. | 06 |
| Q. 5 | a) What is Atomic Packing Factor? Determine APF for BCC. | 05 |
| | b) Explain Invariant reactions found in Fe-C equilibrium diagram. | 04 |
| | c) Explain Austempering process. | 04 |

Section B

- | | | |
|-------|---|----|
| Q. 6 | a) Why alloying elements are added in steel? List alloying elements & state effect of it. | 07 |
| | b) What is Martensitic stainless steel? Explain its properties and applications. | 06 |
| Q. 7 | a) How malleable cast iron produced? Explain different types of malleable cast iron. | 07 |
| | b) What are properties of tool steel? Explain HSS tool steel. | 06 |
| Q. 8 | a) What is α -Brasses? Explain important brasses from this group. | 07 |
| | b) What are gun metals? Explain different types of gun metals. | 06 |
| Q. 9 | a) Explain properties and applications of metal matrix composites. | 07 |
| | b) Enlist major properties of crystalline and non crystalline ceramics. | 06 |
| Q. 10 | a) Explain chilled cast irons. | 05 |
| | b) Explain properties and application of Glasses. | 04 |
| | c) What is free cutting steels? Why it is called so? Explain. | 05 |

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-349
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (Mechanical)
Fluid Mechanics
(OLD)

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Question No. 5 and Q.No.10 are compulsory. Attempt any 2 questions from the remaining questions of each Section.
 - 2) Use of non-programmable calculator is permitted.
 - 3) Assume suitable missing data.

Section A

- Q.1 a) Define fluid mechanics & Explain properties of fluids in detail. 05
 b) A plate, 0.025 mm distant from a fixed plate, moves at 60cm/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 two plates. 08
- Q.2 a) State and prove Pascal's law. 05
 b) A hydraulic press has a ram of 20 cm diameter and a plunger of 3cm diameter. It is used for lifting a weight of 30 kN. Find the force required at the plunger. 08
- Q.3 a) How to determine /calculate the total pressure (F) and centre of pressure (h*) 05
 b) A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and 08
 1) Coincides with water surface 2) 2.5 m below the free water surface.
- Q.4 a) Explain metacenter and metacentric height with neat sketch. 05
 b) A rectangular pontoon is 5m long, 3m wide and 1.20m high. The depth of immersion of the pontoon is 0.80m in sea water. If the centre of gravity is 0.6m above the bottom of the pontoon, determine the meta-centric height. 08
 The density for sea water = $1025 kg/m^3$.
- Q.5 Write short notes on any two:- 14
 a) Types of fluid flow
 b) Continuity equation in 3-dimensions
 c) Euler's equation of motion
 d) Practical applications of Bernoulli's equation.

Section B

- Q.6 a) Define laminar boundary layer. Explain it with neat sketch. 05
 b) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate, and $u=U$ at $y = \delta$, where δ = boundary layer thickness. Also calculate the value of δ^*/θ . 08
- Q.7 a) Obtain Von Karman momentum integral equation. 05
 b) Air is flowing over a flat plate 500 mm long and 600 mm wide with a velocity of 4 m/s. The kinematic viscosity of air is given as $0.15 \times 10^{-4} \text{ m}^2/\text{s}$. Find 08
 1) The boundary layer thickness at the end of the plate.
 2) Shear stress at 200 mm from the leading edge, and
 3) Drag force on one side of the plate. Take the velocity profile over the plate as $\frac{u}{U} = \sin\left(\frac{\pi}{2}, \frac{y}{\delta}\right)$ and density of air 1.24 kg/m^3 .
- Q.8 a) Explain how the major energy losses in pipes are calculated, in detail. 05
 b) Find the head lost due to friction in a pipe of diameter 300 mm and length 50m, through which water is flowing at a velocity of 3 m/s using 08
 1) Darcy formula
 2) Chezy's formula for which $C=60$. Take ν for water = 0.01 stoke.
- Q.9 a) Explain the dimensionless numbers in detail. 05
 b) A pipe of diameter 1.5m is required to transport an oil of sp. gr. 0.90 and viscosity 3×10^{-2} poise at the rate of 3000 lit/sec. Tests were conducted on a 15 cm diameter pipe using water at 20°C . Find the velocity and rate of flow in the model. 08
 Viscosity of water at $20^\circ\text{C} = 0.01 \text{ poise}$.
- Q.10 Write a short note on any two:- 14
 1) Momentum thickness
 2) Classification of models
 3) Minor energy losses
 4) Total drag on a flat plate due to Laminar and Turbulent boundary layer.

Total No. of Printed Pages: 2

SUBJECT CODE NO:- H-419
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (Mech./Prod.)
Design of Machine Element –I
(OLD)

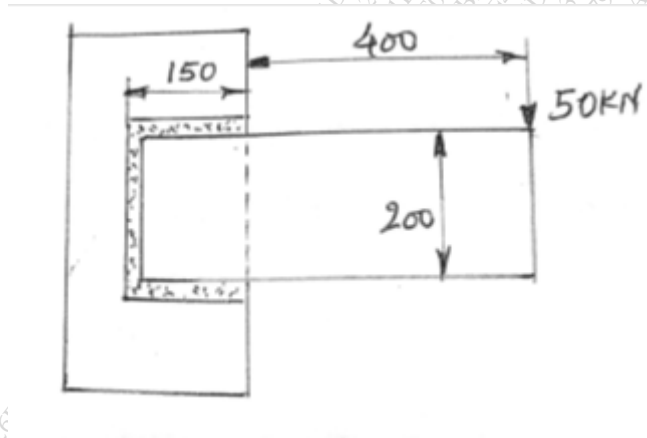
[Time: Three Hours]

[Max. Marks: 80]

- N.B Please check whether you have got the right question paper.
1. Attempt any three questions from each section.
 2. Figures to the right indicates full marks
 3. Assume suitable data, if necessary and state then clearly
 4. Design data book is allowed.
 5. Q. No.5 & Q.No.10 are Compulsory.
- Section - A
- | | | |
|------|---|----|
| Q. 1 | a) Explain preferred series in mechanical design. | 04 |
| | b) Define the following | 04 |
| | i) Stiffness ii) Ductility iii) Creep iv) Hardness | |
| | c) Highlight the concept of Aesthetic design. | 04 |
| Q. 2 | Design a cotter joint used to connect two axial loads subjected to a load of 35KN. The components are made of 30C8 (sy _t = 400MPa) design the joint and specify the main dimensions. | 12 |
| Q. 3 | A machine vice has single start square threads with 25mm nominal diameter and 5mm pitch. The inner and outer diameters of the friction collar are 15mm and 30mm respectively. The coefficient for threads and collar are 0.15 and 0.18 respectively. IF the person operating the vice can exert a force of 120N on the handle at a radius of 200mm, determine | 12 |
| | i) The clamping force developed between the jaws and | |
| | ii) The efficiency of the clamp | |
| | Assume uniform pressure at the contacting collar surface | |
| Q. 4 | Explain in detail the couplings and procedure of rigid flange coupling. | 12 |
| Q.5 | Write short notes on (any four) | 16 |
| | a) Steps in design | |
| | b) Types of keys | |
| | c) Selection and use of theories of failure | |
| | d) Self-locking Screw | |
| | e) Bolts of uniform strength | |
| | f) Preloading of bolts | |

Section –B

- Q.6 A flat bar with a shoulder fillet carries a tensile load which varies cyclically from 5KN to 40KN. The bar material is C-45 for which yield point strength is 360 MPa and endurance strength of 220 MPa for ideal surface finish. Assuming that the bar is machined and has proportion $D/d = 0.2 r/d = 0.2$ and thickness $t = 0.4 \times d$, determine the dimensions of flat bar with factor of safety 3. Use Soderberg's equation Assume $s_{ut} = 630$ MPa. 12
- Q.7 Figure shows an eccentrically loaded welded joint Determine the fillet weld size Allowable shear stress in the weld is 80MPa 12



- Q.8 Derive an expression for stress and deflection for helical compression spring assuming Wahl's correction factors. 12
- Q.9 A railway wagon is moving at a velocity of 2 m/s and is brought to rest by a bumper consisting of two helical compression springs arranged in parallel. The springs are compressed by 150mm in bringing the wagon to rest. The mass of the wagon is 1000kg, the spring index can be taken as 6. The springs are made of oil – hardened and tempered steel wire with ultimate tensile strength of 1500 N/mm^2 and modulus of rigidity of 81370 N/mm^2 . The permissible shear stress for the spring wire can be taken as 50 % of the ultimate tensile strength. Design the spring and calculate 12
- Maximum force on each spring
 - Wire diameter
 - Mean coil diameter
 - Number of active turns of coils.
- Q.10 Write short notes on (any four) 16
- Nipping in multileaf spring
 - Causes of stress concentration
 - Cautking and fullering of riveted joint
 - Advantages of welded joints over riveted joints
 - Notch sensitivity
 - Buckling of spring

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 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) State maximum shear stress theory of failure.
 - ii) Enlist the steps involved in design of machine elements.
 - iii) Draw stress – strain curve.
 - iv) Explain Aesthetic considerations in design.
 - v) Differentiate between rigid and flexible coupling.
 - vi) Enlist applications of power screw and recirculating ball screw.
- Q.2 A cylindrical shaft made of steel with yield strength 700 MPa is subjected to static loads consisting of bending moment 10 KN – m and a torsional moment 30 KN-m. Determine the diameter of shaft using two different theories of failure and assuming a factor of safety 2. Take $E=210$ GPa and Poisson ratio = 0.25.
- Q.3 Draw and design a sleeve and cotter joint to resist a tensile load of 60 KN. All the parts of joint are made of same material with 60 MPa, 70 MPa and 125 MPa, Allowable tensile, shear and compressive stress respectively. 15
- Q.4 Explain with neat sketch, design procedure for flexible coupling. 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 250 mm outside diameter and 100 mm inside diameter. Find the force required at the end of 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 bearing is 0.20. 15

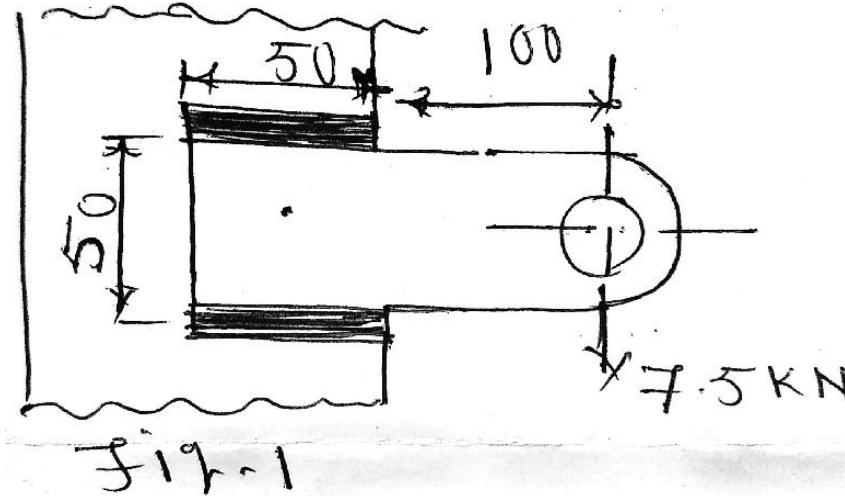
SECTION – B

- Q.6 Solve any five. 10
- i) What is Endurance limit?
 - ii) State causes of stress concentration.
 - iii) Classify riveted joints
 - iv) What is caulking?
 - v) Explain throat and leg of weld.

vi) Give significance of wahl Factor.

Q.7 A Steel rod is subjected to a reversed axial load of 180 kN. Find the diameter of rod for a factor of safety of 2. Neglect column action. The material has an ultimate tensile strength of 1070 MPa and yield strength of 90 MPa. The endurance limit in reversed bending may be assumed to be one half of ultimate tensile strength. Other correction factors may be taken as follows –
For axial loading = 0.7, for machined surface = 0.8, for size = 0.85, for stress concentration = 1.0.

Q.8 A welded connection as shown in fig. 1 is subjected to an eccentric force of 7.5 kN. Determine size of welds if the permissible shear stress for weld is 100 N/mm^2 . Assume static conditions.



Q.9 A railway wagon moving at a velocity of 1.5 m/s is brought to rest by a bumper consisting of two helical spring arranged in Parallel. The mass of wagon is 1500 kg. The spring are compressed by 150 mm in bringing wagon to rest. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire with ultimate tensile strength of 1250 N/mm^2 permissible shear stress for wire 50% of ultimate tensile strength. Design the spring.

Q.10 A helical compression spring made of circular wire, is subjected to an axial force, which varies from 2.5 kN to 3.5 kN over this range of force, the deflection of the spring should be approximately taken as 5 mm. spring index as 5, the spring has square and ground ends. It is made of patented and cold drawn steel wire with ultimate tensile strength of 1050 N/mm^2 and modulus of rigidity as 81370 N/mm^2 design the spring. Also calculate spring rate.

Total No. of Printed Pages:2

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.

1. Q.No.1 and Q.No.6 are compulsory.
2. Attempt any two questions from remaining four questions from each section.
3. Figure to the right indicate full marks.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Solve any five from following. (Any five) | 10 |
| | <ol style="list-style-type: none"> a. Define creep and ductility. b. Define polymorphism. c. Draw sketches of plane (100) and (001). d. Enlist Phases in Fe-C System. e. State any two objectives of hardening heat treatment process. f. What is pearlite? g. What is eutectic reaction? h. What is the necessity of alloying? | |
| Q.2 | <ol style="list-style-type: none"> a. Discuss screw dislocation and edge dislocation with neat sketches. b. Discuss strengthening mechanism for solid solution. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a. Define solid solution? Discuss its types. Explain Hume-Rothery rule. b. Explain Isomorphous system with suitable examples. | 07
08 |
| Q.4 | <ol style="list-style-type: none"> a. Describe the transformations occurring in eutectoid and peritectoid reactions. b. Draw the TTT diagrams and explain the different cooling rates. | 07
08 |
| Q.5 | <ol style="list-style-type: none"> a. What do you mean by carburizing? Discuss its advantages and applications. b. Compare flame hardening with induction hardening? Discuss its advantages and applications. | 07
08 |

Section B

- | | | |
|-----|--|----|
| Q.6 | Solve any five from following. (Any five) | 10 |
| | <ol style="list-style-type: none"> a. Classify steels on basis of furnace used. b. Write composition of free cutting steel. c. Write composition of muntz metal and cartridge brass. d. Give properties of nanomaterials. e. What is effect of silicon in the metallurgy of gray iron? f. Write properties of duralumin. | |

- g. Write name of any two cermet.
 - h. Why brass is always stronger than copper at room temperature?
- Q.7
- a. What do you mean by ferrite stabilizer and austenite stabilizer? 07
 - b. Why are alloying elements added to steels? Discuss effect of manganese, Tungsten, Nickel and Silicon on the properties of steel 08
- Q.8
- a. Compare martensitic and austenitic stainless steel. 07
 - b. Write short note on HSLA and free cutting steel. 08
- Q.9
- a. Explain the various characteristics features of spheroidal graphite cast iron. 07
 - b. How the malleable cast iron is manufactured? 08
- Q.10
- a. Why composite materials are considered now a day as structural materials in engineering applications? 07
 - b. Discuss about alpha, alpha-beta & beta Titanium alloys. 08

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]

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

1. Question No.1 and 6 is compulsory.
2. Solve any Two questions from remaining in Section A and 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
- a) State and prove hydrostatic law.
 - b) What is dynamic viscosity? What are its units?
 - c) A rectangular plate 3m x 2m is immersed horizontal inside a liquid of specific gravity 1.2. Calculate the total pressure on the plate if it is immersed at a distance of 2m from free surface of liquid.
 - d) Define force of buoyancy and metacenter.
 - e) The diameters of a pipe at the sections 1 and 2 are 200 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1 is 4 m/s, find: Discharge and velocity of Section 2.
 - f) Define steady, un-steady, uniform and non-uniform flows.
 - g) State Impulse momentum equation and its Applications.
- Q.2 a) Define total pressure force and centre of pressure. A triangular plate of 1 metre base and 1.5 metre altitude is immersed in water. The plane of the plate is inclined at 30° with free water surface and the base is parallel to and at a depth of 2 metre from water surface. Find the total pressure on the plate and the position of centre of pressure. 08
- b) (i) Determine the specific gravity of a fluid having viscosity 0.07 poise and kinematic viscosity 0.042 stokes. 04
- (ii) Write a note on types of fluid with examples. 03
- Q.3 a) A body has the cylindrical upper portion of 4m diameter and 2.4m deep. The lower portion, which is curved, displaces a volume of 8000 litres of water and its centre of

buoyancy is situated 2.6m. below the top of the cylinder. The centre of gravity of the whole body is 1.6 m below the top of the cylinder and the total displacement of water is 52 KN. Find the metacentric height of the body.

- b) In a smooth inclined pipe of uniform diameter 250mm, a pressure of 50 Kpa was observed 05 at section 1 which was at elevation 10m. At another section 2 at elevation 12m the pressure was 20 kpa and the velocity was 1.25 m/s. determine the direction of flow and the head loss between these two sections. The fluid in the pipe is water. The density of water is 998 kg/m^3 .

Q.4 a) State the law of continuity. Obtain an expression for continuity equation for a three dimensional flow by Cartesian co-ordinates. 08

b) State the principle of venturimeter and derive an expression for the discharge through Venturimeter. 07

Q.5 a) An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives readings of 50 cm of Hg find the rate of flow of oil of Sp. gravity 0.3 when the coefficient of discharge is 0.64. 08

b) Explain velocity potential function and stream function, also explain relation between them. 07

Section – B

Q.6 Attempt any FIVE of the following: 10

- a) Differentiate between radial and axial flow turbine.
- b) With neat sketch, state different types of draft tubes for reaction turbine.
- c) What is priming and why it is necessary in centrifugal pump?
- d) What are the boundary layer characteristics?
- e) What are the repeating variables? How are these selected in dimensional analysis?
- f) Draw Inlet and outlet velocity diagram of pelton wheel turbine.
- g) State the Backinghan's Pi theorem.

Q.7 a) What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation? And How to control it? 08

b) Derive and expression for momentum thickness and energy thickness in boundary layer flows. 07

- Q.8 a) Show that the force exerted by jet of water on moving inclined plate in the direction of jet is given by $F_x = \rho a(V - u)^2 \sin^2 \theta$ where; a = cross-sectional area of jet.
 θ = Angle between jet and the plate
 V = Absolute velocity of jet; u = Velocity of plate in the direction of jet. 07
- b) A 75 mm diameter jet having a velocity of 30m strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate. 08
- (i) When the plate is stationary.
- (ii) When the plate is moving with a velocity of 15 m/s in the direction of jet, away from the jet. Also determine the power, and efficiency of the jet when the plate is moving.
- Q.9 a) State Buckingham's Π Theorem. 08
- The resistance R experienced by a partially submerged body depends upon the velocity V , length of the body L , Viscosity of the fluid μ , density of the fluid ρ and gravitational acceleration g . Obtain a dimensionless expression for R .
- b) Draw the neat sketch of pelton wheel turbine and explain its working also Draw its inlet and outlet velocity diagram. 07
- Q.10 Write short notes on any THREE of the following 15
- a) Francis turbine
- b) Multi-stage Centrifugal pump.
- c) Model analysis and types of similarities.
- d) Minimum starting speed of 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. Solve any two questions from remaining four questions of each section.
 3. Assume suitable data, if required.

Section A

- Q.1 Solve any five: 10
- a) Define length of path of contact. Give its formula.
 - b) Define circular pitch. Give its formula.
 - c) State applications of Bevel & Worm and Worm gears.
 - d) Define compound gear train.
 - e) State any two differences between helical and herringbone gears.
 - f) Define gyroscopic. State applications of it.
 - g) What do you mean by axis of precession?
- Q.2 a) State and prove the law of gearing. 07
- b) Two 20° involute spur gears have a module of 10mm. The addendum is one module. The larger gear has 50 teeth and the pinion has 13 teeth. Does interference occurs? If it occurs, to what value should the pressure angle be changed to eliminate interference? 08
- Q.3 a) Derive an expression for center distance for a pair of spiral gears with neat sketch. 06
- b) The angle between two shafts is 90° . They are joined by two spiral gears having a normal circular pitch of 8mm and gear ratio of 3. If approximate center distance between the shafts is 160 mm and friction angle is 5° . Determine the following for maximum efficiency of the drive. 09
- i) Spiral angles of the teeth
 - ii) Number of teeth on each wheel
 - iii) Exact center distance
 - iv) pitch diameters
 - v) Efficiency
- Q.4 a) Explain effect of gyroscopic couple on four wheeler. 06
- b) The turbine rotor of a ship has a mass of 2200 kg & rotates at 1800 rpm clockwise when viewed from the aft. The radius of gyration of the rotors is 320 mm. Determine the gyroscopic couple and its effect, when:- 09

- i) The ship turns right at a radius of 250 m with a speed of 25 km/hr.
- ii) The ship pitches with the bow rising at an angular velocity of 0.8 rad/sec.
- iii) The ship rolls at an angular velocity of 0.1 rad/sec.

- Q.5
- a) Explain gyroscopic couple on air craft. 05
 - b) What do you mean by gear train? Explain compound gear train with neat sketch. Determine velocity ratio for the same. 05
 - c) Explain undercutting of gears. 05

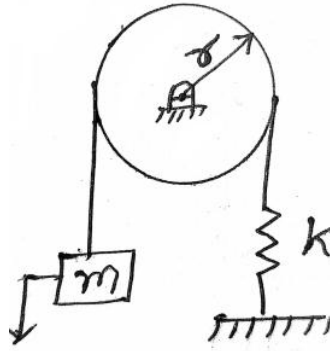
Section B

- Q.6 Solve any five: 10
- a) Differentiate between functions of flywheel and governor.
 - b) Define Turning moment diagram.
 - c) What do you mean by slip of belt.
 - d) State the law of belting.
 - e) Define critical damping in damped free vibrations.
 - f) Enlist various seismic instruments.
 - g) Define transverse vibration with neat sketch.

- Q.7 06
- a) Explain portel governor with neat sketch.
 - b) The turning moment diagram for a multicylinder engine has been drawn to a scale of 1 mm to 90 500 N.m torque and 1 mm to 6° of crank displacement. The intercepted areas between output torque line & mean resistance line taken in order from one end, in sq.mm are -30, +410, -280, +320, -330, +250, -360, +280, -260 sq.mm, when the engine is running at 800 r.p.m. The engine has a stroke of 300 mm and the fluctuation of speed is not to exceed $\pm 2\%$ of the mean speed. Determine a suitable diameter and cross-section of the flywheel rim for a limiting value of the safe centrifugal stress of 7MPa. The material density may be assumed as 7200 kg/m³. The width of the rim is to be 5 times the thickness.

- Q.8 07
- a) Obtain an expression for the length of a chain.
 - b) Power is transmitted using a V-belt drive. The included angle of V-groove is 30°. The belt is 20 mm deep and maximum width is 20 mm. if the mass of the belt is 0.35 kg per meter length and maximum allowable stress is 1.4 MPa, determine the maximum power transmitted when angle of lap is 140°.

- Q.9 09
- a) Determine the natural frequency of the spring mass pulley system as shown in figure, where
 - r → radius of pulley;
 - m → mass of pulley;
 - k → spring stiffness.



b) Derive an expression for natural frequency of undamped spring mass system using Energy method. 06

Q.10 a) Explain overdamping, under damping and critical damping with neat sketches. 07

b) Derive an expression for length of open belt drive. 08

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-549
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (Mechanical)
Modern Management Technique
(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"> a) Define – TQM b) Explain – Just in Time c) Define – Quality d) Define – Kaizen e) Define Lean Manufacturing f) What is SMED? g) Explain – Histogram | |
| Q.2 | <ol style="list-style-type: none"> a) Explain POKA YOKE process with example. b) Explain principles of Management. | 08
07 |
| Q.3 | <ol style="list-style-type: none"> a) Explain Toyota production System. b) What are the objectives of Management? | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) Explain Eight Mudras. b) Explain various JIT Implementation Issues. | 08
07 |
| Q.5 | <ol style="list-style-type: none"> a) Explain Lean Manufacturing Process. b) Explain Single Minute Exchange of Dies. | 08
07 |

Section B

- | | | |
|-----|---|----|
| Q.6 | Attempt any five:- (2 marks each) | 10 |
| | <ol style="list-style-type: none"> a) Define – OEE b) Define – Quality of Work Life c) Define – creativity and Innovation d) What is PDCA Cycle? e) Define – Process Capability. f) Define – MTBF g) Define – MTTR | |

- Q.7 a) What is Yellow Hat Thinking? 08
 b) Explain 8 Pillars of TPM. 07
- Q.8 a) A plant is operating on three shifts Basis. Time not available due to various reasons 08
 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.
 b) Explain the steps involved in TPM. 07
- Q.9 a) Explain Six Sigma. 08
 b) Explain Six Thinking Hats. 07
- Q.10 a) Explain DMAIC Process. 08
 b) What is the difference between creativity, Innovation and Invention? 07

Total No. of Printed Pages:2

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

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
1. Attempt any three questions from each section.
 2. Assume suitable data and dimensions if required.
 3. All dimensions are in mm.

Section A

- | | | |
|-----|--|----|
| Q.1 | a) Explain the effect of rake angle on the life of cutting tool. | 05 |
| | b) The following equation for tool life is given for a turning operation $VT^{0.13} f^{0.77} d^{0.37} = C$ A 60 08 min tool life was obtained while cutting at $V=30\text{m/min}$, $f=0.3\text{mm/rev}$ & $d=2.5\text{mm}$. Determine the change in tool life if the cutting speed, feed and depth of cut are increased by 20% individually and also taken together. | |
| Q.2 | a) Explain the tool wear in detail. | 05 |
| | b) Describe with neat sketch nomenclature of drill bit. | 08 |
| Q.3 | a) Write a note on 'Tool designation system'. | 08 |
| | b) Explain with neat sketch 12 DOF for body in space. | 05 |
| Q.4 | Design a drill jig for given component shown in figure.1, 4 Holes of $\phi 10$ | 14 |

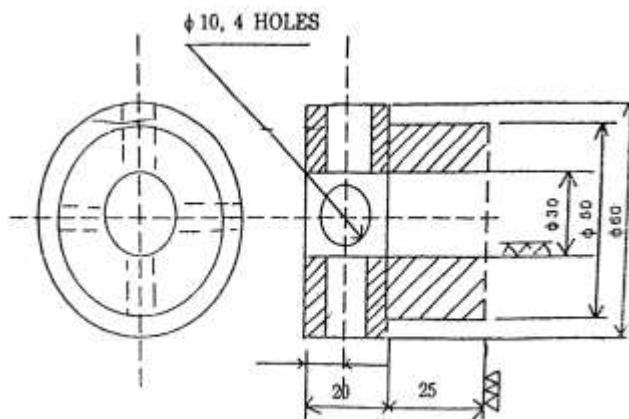


Fig.1

- | | | |
|-----|--|----|
| Q.5 | a) Explain in detail types of drill bushes with neat sketch. | 08 |
| | b) Define jig and fixture. State its importance. | 05 |

Section B

- Q.6 a) Differentiate between combination die and progressive die. 07
 b) Define following press operation 06
 i) Lancing
 ii) Perforating
 iii) Shaving
- Q.7 a) Explain ‘Bending terminology’ with neat sketch. 07
 b) Why deep drawing operation is perform in more than one operation. 06
- Q.8 a) Explain the basic rules for die design of forging. 08
 b) State advantages of Multi-impression dies. 05
- Q.9 Write notes on (any two) 14
 i) Strip layout
 ii) Open die forging
 iii) Forming die
- Q.10 A cup of 60mm in diameter and 80mm deep is to be drawn from 1.5mm thick drawing steel with 13
 tensile strength of 240 N/mm^2 . The corner radius is negligible. Determine
 a) Blank diameter
 b) Number of drawing operation
 c) Force for the first draw with 45% reduction

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-159-B
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. 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) During orthogonal machining operation of C-40 steel, the following data were obtained 08
 Uncut chip thickness = 0.127mm
 Width of cut = 6.35mm
 Cutting speed = 2m/s
 Cutting force = 560N
 Thrust force = 270N
 Chip thickness = 0.25mm
 Rake angle = 10°
 Calculate shear angle, friction angle, shear stress along shear plane and shear strain.
- b) Write note on ORS tool designation system. 04
- Q.2 a) What is tool life? Write Taylor's tool life and modified Taylor's tool life equation. Explain the 08
 parameters affect tool life.
- b) How tool wear affects tool life? Explain types of tool wear. 04
- Q.3 a) Explain different types of locating elements. 08
 b) Suggest suitable elements for locating a cylindrical component? Explain with neat sketch. 04
- Q.4 Design and draw drill jig for the component as shown in figure 1. - 4 Holes of $\varnothing 10$ 16

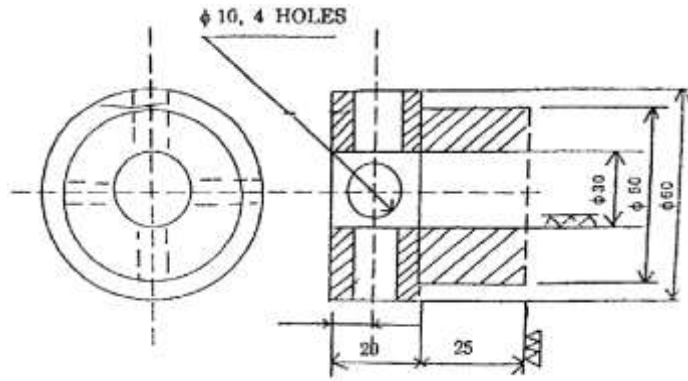
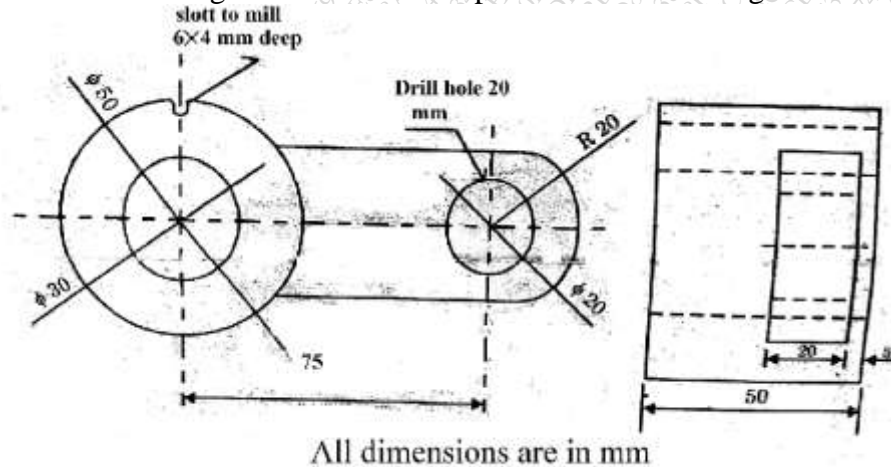


Fig. 1

OR

Design and draw a milling fixture for the component as shown in figure 2.

16



All dimensions are in mm

Fig.2
Section B

- Q.5 Describe with neat sketch the nomenclature of following elements. 12
- Twist drill
 - Pull type broach
- Q.6 a) Suggest a suitable die for producing washer. Explain in detail with neat sketch. 08
 b) Write a note on strip strap layout. 04
- Q.7 a) Explain in detail bending terminology. 08
 b) Write a note on deep drawability. 04
- Q.8 Sketch and design progressive die to make a steel washer. 60mm outside diameter with 30mm hole from 2mm thick sheet. The ultimate shear strength of material is 400N/mm^2 , 16
 Calculate
- Punch and die size
 - Maximum punch force
 - Draw two views of assembly

OR

The symmetrical cup work piece is shown in figure 4 has to be made from cold rolled steel (yield strength is 540 N/mm^2) and 1.2mm thick. Make the necessary calculation for designing the drawing die for this part. 16

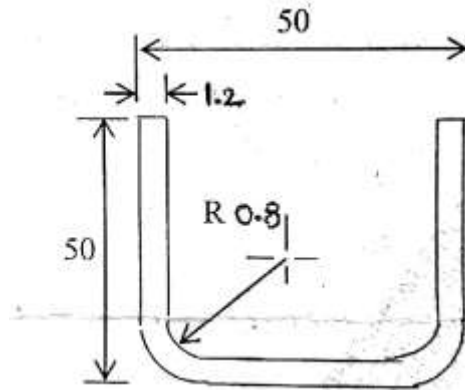


Fig. 4

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-564
FACULTY OF SCIENCE AND TECHNOLOGY
T.E (Mechanical)
Design of Machine Elements -II
(Revised)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

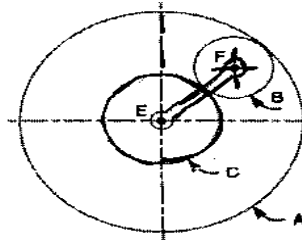
N.B

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

Section A

- Q.1 Solve any five 10
- i) What are the friction material properties
 - ii) How gears are classified?
 - iii) Enlist classification of bevel gears and its application.
 - iv) Define formative number of teeth in helical gears.
 - v) Write down the Torque equation of cone clutch for uniform wear and uniform pressure theory.
 - vi) What are the various forces acting on worm and worm gears?
 - vii) Write a note on efficiency of worm gear.
- Q.2 A pair of bevel gears with 20° pressure angle consists of 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm while the face width is 20 mm. The material for the pinion and gear is steel 50 C4 ($\sigma_{ut} = 750 \text{ N/mm}^2$). The gear teeth are lapped and ground (class-3) the surface hardness is, 400 BHN. The Pinion rotates at 500 r.p.m. and receives 2.5 kw power from the electric Motor. The starting torque of the motor is 150% of the rated torque. Determine the failure of safety against bending failure & against pitting failure. Given $e = 0.0125\text{mm}$ & $C = 114 \text{ KN/mm}^2$. 15
- Q.3 A pair of spur gear with 20° full depth involute teeth is used to transmit 25kW at 900 rpm of the pinion. The gear ratio is 6.25:1, the material for pinion is plain cast steel with permissible static stress of 103 MPa and for gear cast iron with permissible static stress of 55 MPa wear load factor 1.3 N/mm^2 and dynamic load factor for carefully cut gear with 0.035 mm error $C = 283 \text{ kN/m}$. determine module, face width from the stand point of beam strength, dynamic load and wear. Use minimum number of teeth on pinion as 18. Assume $K_v = \frac{3}{3+v}$ and $y = [0.154 - (0.912/$
No. of teeth)] 15

Q.4 An epicyclic gear consists of three gears A, B and C as shown in Fig. 13.10. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m. if the gear A is fixed, determine the speed of gears B and C. 15



Q.5 a) Derive an expression for torque transmitted by single plate clutch by uniform pressure theory. 05

b) A multidisc clutch consists of five steel plates and four bronze plates and transmits 10 kW power at 750 rpm. The ratio of outer diameter to inner diameter of friction discs is 2. The coefficient of friction is 0.1 and the intensity of pressure on friction lining is limited to 0.3 N/mm². Assuming uniform wear theory, calculate inner and outer diameters of friction discs. 10

Section B

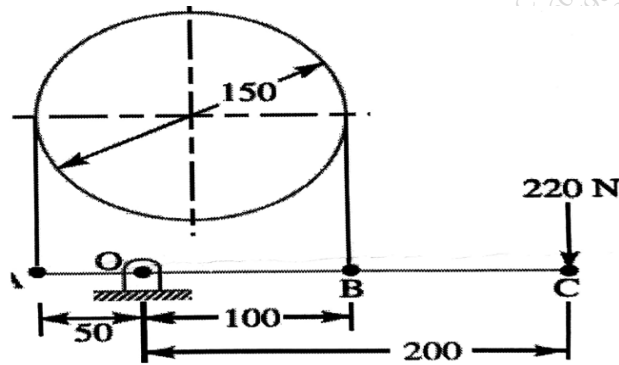
Q.6 Solve any five 10

- i) Explain self-locking and self-energizing brake.
- ii) Important factors to be considered in brake design.
- iii) What are the various belt materials and criteria for its selection?
- iv) Compare between open belt drive and cross belt drive.
- v) Compare sliding contact bearing and rolling contact bearing.
- vi) Explain slip of belt.
- vii) Justify centrifugal tension has no effect on power transmitted.

Q.7 A flat belt is required to transmit 30kW from a pulley of 1.5 m effective diameter running at 300 r.p.m. the angle of contact is spread over 11/24 of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is 1100 kg/m³ and the related permissible working stress is 2.5 MPa. 15

Q.8 A differential band brake has a force of 220 N applied at the end of a lever as shown in Fig. the coefficient of friction between the band and the drum is 0.4. the angle of lap is 180°. Find: 15

1. The maximum and minimum force in the band, when a clockwise torque of 450 N-m is applied to the drum; and
2. The maximum torque that the brake may sustain for counter clockwise rotation of the drum.



All dimensions in mm.

Q.9 A 100 mm diameter shaft operating at 2000 rpm is supported in a 140 mm long full journal bearing 15 subjected to a radial load of 43 kN. Operating temperature of oil is limited to 80°C and surrounding air temperature is 38°C . Assume $ZN/p=30 \times 10^{-6}$. Using McKee and Lasche equation, determine coefficient of friction, bearing pressure H_g and H_d viscosity Z of the lubricant. Assume Practical value of $r/c = 100$

Q.10 a) Explain variable loading in bearing. 05

b) A deep groove ball bearing with the inner race rotation has a 10 sec work cycle as follows 10

For 2 sec: $F_r = 3567\text{ N}$, $F_a = 1785\text{ N}$, $N = 900\text{ r.p.m}$ & light shock for 8 sec $F_r = 2675\text{ N}$, $F_a = 0$. $M = 1200\text{ r.p.m}$. & steady shock. The static & dynamic load rating are $C_0 = 16225\text{ N}$, $C = 22825\text{ N}$ respectively. Find the rating life of the bearing in years of 275 days each for 8 hrs a day operation.

Given that $S = 1.5$

And for $F_a/C_0 = 0.11$, $e = 0.3$

For $F_a / V F_r > e$, $y = 1.45$

For $F_a / V F_r < e$, $y = 0$

And $X = 0.56$

symbols for their usual meaning.

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-571
FACULTY OF SCIENCE & TECHNOLOGY
T.E. (Mechanical)
Heat Transfer
(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) Gives the relationship between efficiency and effectiveness of fins.
 - 2) What are the differences between Thermodynamic and Heat transfer?
 - 3) How is the relation between temperature and thermal conductivity of material?
 - 4) Define grashoff's number.
 - 5) A hot plate $1m \times 1.5m$ is maintained at 300°C . Air at 20°C blows over the plate. If the convective heat transfer coefficient is $20 \text{ W}/m^2 \text{ }^\circ\text{C}$, Calculate the heat transfer rate.
 - 6) What are significant of Fourier number?
 - 7) What is unsteady heat conduction?
- Q.2
- a) Explain the mechanisms of conduction, convection and radiation with suitable examples. 07
 - b) A square plate heater ($15\text{cm} \times 15\text{cm}$) is inserted between two slabs. Slab A is 2 cm thick ($K = 50 \text{ W}/m \text{ }^\circ\text{C}$) and slab B is 1 cm thick ($K = 0.2 \text{ W}/m \text{ }^\circ\text{C}$). The outside heat transfer coefficients on sides A and side B are $200 \text{ W}/m^2 \text{ }^\circ\text{C}$ and $50 \text{ W}/m^2 \text{ }^\circ\text{C}$ respectively. The temperature of surrounding air is 25°C . If rating of heater is 1 kW, find: 08
 1. Maximum temperature in the system.
 2. Outer surface temperature of two slabs.
 3. Draw equivalent Electrical circuit.
- Q.3
- a) Derive the general form of the energy equation for one dimensional heat dissipation from an extended surface (rectangular fin). 08
 - b) One end of a long rod, 35 mm in diameter, is inserted in to furnace with other end projecting in outside air. After steady state reached, temperature of rod is measured at two point's 180 mm apart and found to be 180°C and 145°C . The atmospheric air temperature is 25°C . If heat transfer coefficient is $65 \text{ W}/m^2 \text{ }^\circ\text{C}$. Calculate thermal conductivity of rod. 07
- Q.4
- a) Find the convective heat loss from a radiator 0.5 m wide and 1 m high maintained at a temperature of 84°C in a room at 20°C . Consider the radiator as a vertical plate. 08

- b) Air at 25°C is flowing over a flat plate which is 300 mm wide and 600 mm long. The plate is maintained at 95°C. Find the heat loss per hour from the plate if the air is flowing parallel to 600 mm side with 2.5 m/s velocity. What will be the effect on heat transfer if the flow is parallel to 300 mm side? 07

The properties of air at $\frac{95+25}{2} = 60^\circ\text{C}$ $k = 0.025 \text{ W/m}^\circ\text{C}$, $v = 18.97 \times 10^{-6} \text{ m}^2/\text{s}$, $\text{pr}=0.7$, $C_p = 1.005 \text{ kJ/kg}^\circ\text{C}$.

- Q.5 Write Short notes on(solve any two) 07
- Hydraulic and thermal boundary layer. 07
 - Heat transfer through hollow cylinder. 07
 - Lumped heat capacity method. 08

SECTION-B

- Q.6 Attempt any five of the following:- 10
- What is film wise condensation?
 - What is gray body?
 - What is scale heat transfer coefficient in heat exchanger?
 - Define Stefan Boltzmann law.
 - What is sub-cooled boiling?
 - Define shape factor.
 - What is the heat exchanger?

- Q.7 a) Discuss the different types of processes for condensation of vapors on a solid surface. 08
- b) An electric wire of 1.25 mm diameter and 250 mm long is laid horizontally and submerged in water at atmospheric pressure. The wire has an applied voltage of 18 V and carries a current of 45 amperes. Calculate: 07

- The heat flux, and
 - The excess temperature,
- The following correlation for water boiling on horizontal submerged surface

$$\text{holds good: } h = 1.58 \left(\frac{Q}{A}\right)^{0.75} = 5.62 (\Delta t_e)^3, \text{ W/m}^2 \text{ }^\circ\text{C}.$$

- Q.8 a) Derive the expression for LMTD for counter flow heat exchanger. 07
- b) A chemical (Specific heat = 3.3 kJ/kg K) enters a parallel flow heat exchanger at 120°C 08
- At a flow rate of 20,000 kg/hr. Cooling water (specific heat = 4187 J/kg K) enters the heat exchanger at 20°C at a flow rate 1000 kg/min. Heat transfer area of the heat exchanger is 12 m². Over all heat transfer coefficient can be taken as 1000 W/m²k. Find the effectiveness of the heat exchanger and outlet temperatures of both chemical and water.

- Q.9 a) The radiation shape factor of the circular surface of a thin hollow cylinder of 10 cm diameter and 10 cm length is 0.1716. What is the shape factor of curved surface of the cylinder with respect to itself? 08
- b) Define the following terms 07
- 1) Monochromatic emissive power,
 - 2) Reflectivity
 - 3) Emissive power
 - 4) Emissivity
- Q.10 Write Short notes on (Solve any two)
- a) Effectiveness for counter flow by NTU method. 07
 - b) Radiation Shield 07
 - c) Wien's displacement Law. 08

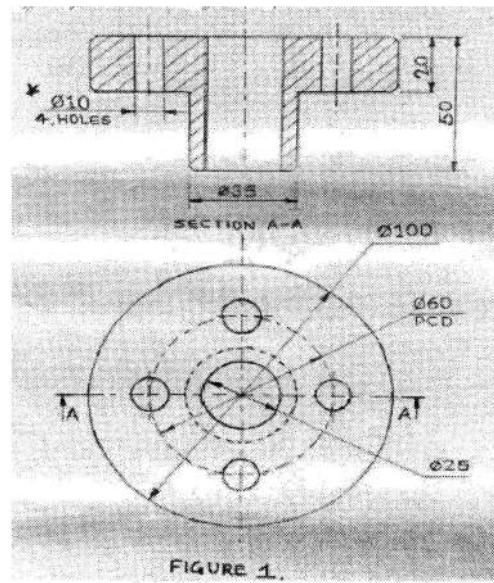
Total No. of Printed Pages:3

SUBJECT CODE NO:- H-578
FACULTY OF SCIENCE & 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
- i) Q. No.4 and Q. No.8 are compulsory. Attempt any two questions from the remaining questions of each section.
 - ii) Solve Q. No.4 on drawing sheet.
 - iii) Assume suitable data and dimensions if necessary.
 - iv) All dimensions are in mm.
- SECTION -A**
- Q.1
- a) Differentiate between and oblique cutting. 06
 - b) Explain the various elements of a single point cutting tool with the help of sketches. 06
- Q.2
- a) In orthogonal cutting operation, cut of 2.5mm wide was made with 0.26 mm feed and 0.5 m/s cutting speed using a Hss tool having 10° take angle the chip thickness ratio is found to be 0.6 the cutting force is 1200 N and the feed thrust force 340 N determine chip thickness, shear plane angle resultant force. Coefficient of friction on face of tool. Friction force and normal force on chip, shearing force and normal force on the shear plane, specific energy. 06
 - b) Draw merchant's circle diagram. Write the relationship among different components and the resultant cutting forces. 06
- Q.3
- a) What is mean by fool proofing as applied to jig and fixture ? How it can be achieved? 06
 - b) Write note on (any two) 06
 - a) Why jig and fixture are called production tool.
 - b) Explain design principles for Drill Bushing.
 - c) Write notes on diamond pin.
- Q.4
- Design a drill jig to drill 10mm holes in the work piece as shown in figure.1. 16
- a) Draw minimum two views of assembly of jig.
 - b) Draw the detailed drawing of jig plate and bush
 - c) Represent bill of material (BOM)



Design draw and dimension a milling fixture to mill a slot of size 8×4 mm in the component shown in fig.

16

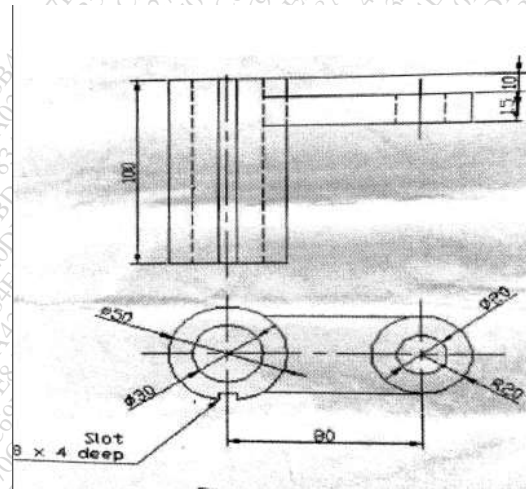


Figure 2

SECTION B

Q.5 Draw neat sketches of the following with nomenclature of their elements

12

- i) Internal Broach
- ii) twist Drill
- iii) Single point cutting tool.

Q.6 a) Explain with neat sketches the following basic die-cutting operations

06

- i) Perforating
- ii) Notching

b) What is meant by die clearance? is the die clearance placed on the punch or die opening for a blanking operations and piercing operations? Explain with neat sketches.

06

- Q.7 a) What is center of pressure? How it determined? 06
 b) Write short note on strip Layout give suitable example. 06

Q.8 Design blanking die to blank the work piece shown in figure.3 16

Design should include

- i) Design of punches and die openings
- ii) Strip layout (s) out center of pressure
- iii) Force calculation
- iv) Assembly drawing of die

Assume thickness of blank = 1.2mm and shear strength = 420 N/mm².

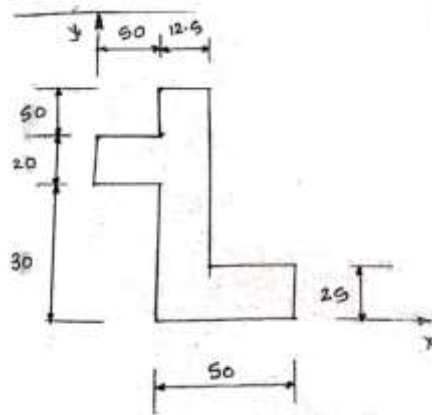
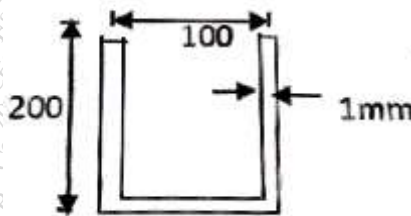


Figure 3

OR

A Cylindrical cup as shown in fig 2 is to be drawn of CR sheet of 1 mm thickness make necessary. Calculations to design a drawing die for this component.



Total No. of Printed Pages:03

SUBJECT CODE NO:- H-585
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (MECHANICAL)
CAD/CAM
(Revised)

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

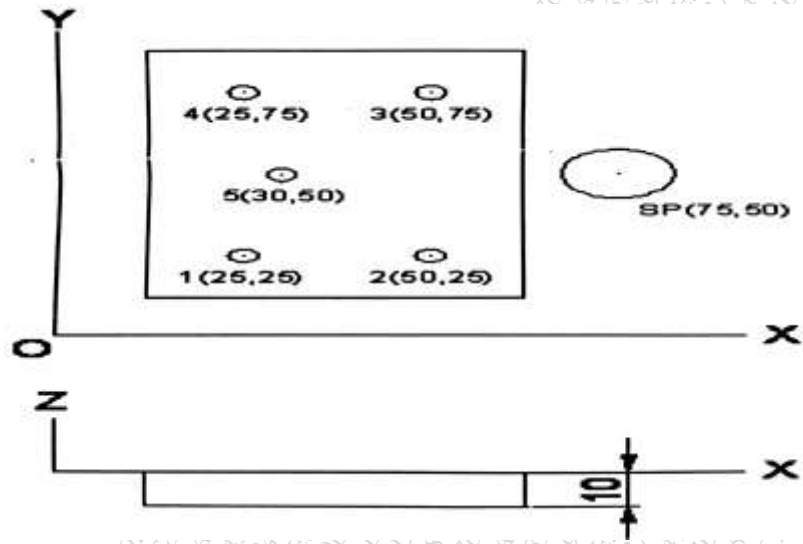
- N.B
- i. Q.No.1 and Q.No.6 are compulsory.
 - ii. Solve any two questions from remaining questions from each section.
 - iii. Assume suitable data, if required

Section A

- Q.1 Solve any five 10
- a) Define the term Concurrent engineering.
 - b) Draw PLM Flow chart for CAD.
 - c) State benefits of CAM.
 - d) What is scaling?
 - e) What is a Composite transformation?
 - f) What are Perspective projections?
 - g) Explain Surface and Solid modeling?
 - h) State CAD/CAM applications.
- Q.2 08
- a) Explain in short
 - i. Translation
 - ii. Scaling
 - iii. Rotation
 - iv. Reflection
 - b) What are the Functions of graphics system? 07
- Q.3 15
- A triangle is defined in 2D space by its end points A (2,2), B(6,2), C(2,6). Express them in matrix notation and perform the following transformations and show it graphically.
- 1) Scale it by a factor of 1.5
 - 2) Rotate it by 90^0 about origin.
- Q.4 07
- a) Explain any one Modern solid modeling techniques.
 - b) Explain the role played by CSG in solid modeling and the various operations to be carried over to construct the 3-D geometry. 08
- Q.5 15
- Write short notes on (any three)
- a) CAPP (Computer Aided Process Planning)
 - b) Homogeneous and Concatenated representation
 - c) B-Spline curve
 - d) Primitive instancing

Section B

- Q.6 Solve any five. 10
- a) State NC motion control system.
 - b) State advantages of CNC over DNC.
 - c) State disadvantages of NC
 - d) State technical features of a robot.
 - e) What is Laminated Object Manufacturing?
 - f) Enlist applications of FMS?
 - g) State various part programming languages.
 - h) State merits of GT?
- Q.7 Write down the manuscript of the manual part programme for the drilling operation to be performed on a square plate of 100 mm side. Six equidistance holes of 10 mm diameter are to be drilled on the PCD of 70mm the center of the pitch circle is coinciding with the center to the plate. Use the following information. 15
- 1) Thickness of the part is 20 mm
 - 2) Use TAB sequential format.
 - 3) Specify the dimensions/ travels/ increments in microns.
 - 4) Assume suitable starting point.
- Q.8 a) Explain methods of robot programming. 08
 b) Discuss Fusion Deposition Modeling. 07
- Q.9 a) Define NC, CNC, and DNC 05
 b) Write a Programme for drilling holes 1 to 5 in the flat shown in figure. 10
- Feed = 5 mm/rev
 - Drill = 15 mm
 - Speed = 600 rpm
- Write down the complete APT programme consisting of
- 1) Geometry statements to define the geometry
 - 2) Motion statements to perform the profile milling
 - 3) Auxiliary statements
 - 4) Post processor statements



- Q.10 Write short notes on (any three)
- Basic components of NC
 - Robot programming languages
 - CNC controllers
 - Elements of FMS

15