Code: 4G554

III B.Tech. I Semester Supplementary Examinations May 2019

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Write the mechanical properties of the material to be considered while designing of machine component.   7M

   b) Find out the numbers of R10 basic series from 1 to 10.   7M

OR

2. a) Discuss the following
      i) Maximum Principal strain theory
      ii) Distortion Energy Theory   6M

   b) A shaft of 25mm diameter is subjected to a torque of 60N-m and a bending moment of 90N-m and an axial load of 6 KN. Calculate factor of safety according to
      i) Maximum normal stress theory and
      ii) Maximum shear stress theory
   Assume yield strength of the shaft material as 400MPa   8M

UNIT–II

3. a) What is stress concentration? Give three examples with sketches how to minimize the stress concentration.   7M

   b) Determine the size of a piston rod subjected to a total load having cyclic fluctuation from 150 KN (compression) to 25 KN (tension). The endurance limit is 360 MPa and yield strength is 400 MPa. Take factor of safety = 1.5; surface finish factor = 0.88 and stress concentration factor = 2.25.   7M

OR

4. a) Develop the equations for Soderberg and Goodman criterion.   7M

   b) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250 N/mm^2. The bar is made of steel 40C8 (S_{ut}= 600 N/mm^2). Calculate the life of the bar for a reliability of 90%.   7M

UNIT–III

5. a) What is meant by bolt of uniform strength? Explain how can it will be obtained.   6M

   b) A steel plate subjected to a force of 3 kN and fi xed to a vertical channel by means of four identical bolts is shown in Fig. 1. The bolts are made of plain carbon steel 45C8 (S_{yt}=380N/mm^2) and the factor of safety is 2. Determine the diameter of the shank.

                                                                                                                8M
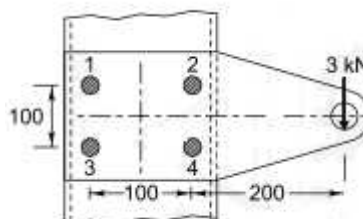
OR

6.   A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load P, as shown in Fig. 1. Determine the weld size if shear stress in the same is not to exceed 140 MPa.
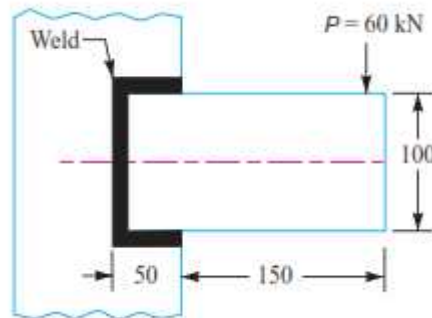
14M

UNIT–IV

7. a) What are the applications of cotter joints?   2M

    b) Two rod ends of a pump are joined by means of a cotter and spigot and socket at the ends design the joint for an axial load of 100 kN which alternately changes from tensile to compressive. The allowable stresses for the material used are 50 MPa in tension, 40 MPa in shear and 100 MPa in crushing.   12M

OR

8. a) Explain the stresses induced in keys.   4M

    b) 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.   10M

UNIT–V

9. a) How the shaft is designed when it is subjected to twisting moment and axial stress?   4M

    b) A shaft is transmitting 97.5 kW at 180 r.p.m. If the allowable shear stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more than 1° in a length of 3 m. Take C = 80 GPa.   10M

OR

10. a) Explain types of couplings.   4M

    b) Design a bushed-pin type flexible coupling for connecting a motor shaft to a
        pump shaft, with the following service conditions:

        Power to be transmitted   =   40kW
        Speed of the motor shaft   =   1000rpm
        Diameter of motor and pump shafts =   45mm
        Bearing pressure on the rubber bush =   0.7N/mm².
        Allowable stress in the pins   =   60MPa.   10M

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III B.Tech. I Semester Supplementary Examinations May 2019
Heat Transfer
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. A solar radiant heat flux of 700 W/m^2 is absorbed in a metal plate that is perfectly insulated on the back side. The convection heat transfer coefficient on the plate is 11 W/m^2-K. and the ambient air temperature is 300 K. Calculate the temperature of the plate under equilibrium conditions.

OR

2. From First principle, derive the 2-D governing equation of conduction heat transfer in rectangular coordinate for the following conditions. Steady state, incompressible, isotropic material, without heat generation.

UNIT–II

3. The handle of a ladle used for pouring molten lead at 327°C is 30 cm long and is made of 2.5 X 1.5 cm mild steel bar stock (k = 43 W/m-K). In order to reduce the grip temperature, it is proposed to make a hollow handle of mild steel plate1.5 mm thick with same rectangular shape. If the surface heat transfer coefficient is 14.5 W/m^2-K and the ambient air is 27°C, estimate the reduction in temperature of the grip.

OR

4. A long cylindrical rod made of copper is 2 cm in diameter is at -190°C. It is exposed to warm air at a temperature of 50°C. Find the time taken by the rod to heat up to a temperature of 10°C if the surface heat transfer coefficient is 20 W/m^2-K. For copper Thermal conductivity = 330W/mK, and thermal diffusivity = 95X10^{-6} m^2/s. Justify if you can neglect the internal resistance of the cylindrical rod.

UNIT–III

5. Air at 1 bar and 40°C flows parallel to and on both sides of a flat plate (20 cm^2) with a velocity of 15 m/s. If the plate is maintained at a temperature of 20°C, calculate the rate of heat transfer to the plate and the drag acting on the plate. Air properties are density = 1.13 kg/m^3, k = 0.0276 W/m-K, Pr = 0.699, kinematic viscosity = 16.96 X 10^{-6} m^2/s.

OR

6. Define and explain the hydrodynamic and thermal boundary layers. How does their thicknesses vary with Prandtl Numbers. Consider a vertical plate (0.5 m high) maintained at a temperature of 100°C and losing heat by natural convection to air at 1 bar and 40°C. Show that the flow is laminar or turbulent.

UNIT–IV

7. Two concentric spheres have diameters of 50 cm and 25 cm. The inner sphere is maintained at 10 K and the outer sphere is maintained at 300 K. A radiation shield of 35 cm diameter is placed in the annulus. The annulus is completely evacuated. If all the radiating surfaces have the emissivity 0.05, calculate the net radiation heat transfer between the surfaces a) with and b) without the radiation shield.

OR

8. a) Draw and explain the different phases of pool boiling.

    b) What is the estimated surface temperature of Sun? How it has been calculated.

UNIT–V

9. A double tube heat exchanger is used to heat the oil (flow rate 1110 kg/hr and specific heat 2.1 kJ/kg-K) from 27°C to 49°C. Oil flows through the inner copper tube(OD 2.86 cm, ID 2.54 cm). The oil is heated by hot water flowing through the outer tube flowing at 390 kg/hr at the inlet temperature of 93°C. The surface heat transfer coefficients on the oil side and water side are 635 W/m^2-K and 1270 W/m^2-K respectively. Take the thermal conductivity of copper is 350 W/m-K. Calculate the length of the heat exchanger tube when it is a counter flow type.

OR

10. a) Give a detailed classification of heat exchangers used for industrial applications.

    b) For a counter flow heat exchanger, effectiveness = {1-exp[-(1-C)NTU]}/{1-Cexp[-(1-C)NTU]}, where C is the heat capacity ratio. If there will be condensation on one side of the heat exchanger, what will be its effectiveness?

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R-14

Code: 4GA51

III B.Tech. I Semester Supplementary Examinations May 2019
Managerial Economics and Financial Analysis
(Common to CE, ME and ECE)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1.   What do you understand by elasticity of demand? How do you measure its. What is its significance?

OR

2.   Write elasticity demand and factors governing elasticity of demand.

UNIT–II

3.   State the break even analysis? Explain objectives, importances and show the graphical representation of BEP.

OR

4.   Rainbow enterprises deals in the supply of computers the following cost data available for two successive periods

	Year 1 Rs	Year 2 Rs
sales	50000	120000
Fixed costs	10000	20000
Variable cost	30000	60000

determine

   a) p/v ratio   4 marks
   b) breakeven point   5 marks
   c) margin of safety   5 marks

UNIT–III

5.   Elaborate monopoly market and price out-put determination in short run and long run.

OR

6. a) What are the causes for the emergence of monopoly?

   b) How is the equilibrium position attained by monopoly list under varying cost conditions?

UNIT–IV

7.   What is working capital? Explain the factors governing working capital requirements?

OR

8.   A business firm is thinking of choosing the right machines for their purpose after financial evolution of the proposals the initial cost and the net cash flow over five years to the business firm have been calculated for each machine as follows.

	Machine 1 (Rs)	Machine 2 (RS)
Initial cost	20000	28000
annual cash inflow 1year	8000	10000
2 year	12000	12000
3 year	9000	12000
4 year	7000	9000
5 year	6000	9000

Choose the machine based on i) payback period ii) accounting rate return

UNIT–V

9. From the following trial balance of xyz ltd prepare trading and profit&loss account for the year ending 31-3-2017 and balance sheet as on date considering the adjustments given below:

Debit balances	Rs	Credit balances	Rs
buildings	70000	Carriage in wards	1291
Motor trucks	12000	Reserve doubtful debts	1320
furniture	1640	Establishments expenses	2135
debtors	15600	Carriage out wards	800
creditors	18852	insurance	783
stock	15040	interest	340
Cash in hand	988	bad debts	613
Cash at bank	14534	Audit fee	400
Bills receivables	5844	General expenses	3050
purchases	85522	investments	8922
discount	945	sales	121850
Returns in word	285	capital	920000
		Bills payable	6930
		rent	900

Adjustments: 1) closing stock Rs 15000 2) depreciation on motor trucks 20% and furniture 10% per annum 3)write of bad debts of Rs100 and maintain at 5% reserve for doubtful debts 4) prepaid insurances Rs 150   5)interest accrued but not received Rs 120

OR

10. Write Short notes on
   a) Liquidity ratios   3M
   b) Profitability ratios   4M
   c) Activity ratios   4M
   d) Capital structure ratios are illustrating suitable example. 3M

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