Hall Ticket Number :										

R-14

Code: 4G554

III B.Tech. I Semester Supplementary Examinations November 2018

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) What is the general procedure adopted in the design of machine elements? 7M

   b) A mass of 50 kg drops through 25mm at the centre of a 250 mm long simply supported beam. The beam has a square cross-section. It is made of steel 30C8 (Syt = 400 N/mm^2) and the factor of safety is 2. The modulus of elasticity is 207 000 N/mm^2. Determine the dimension of the cross section of the beam. 7M

OR

2. a) Explain briefly about the preferred numbers. 4M

   b) A Mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to i. Rankine's theory; ii. Guest's theory; and 3. The maximum distortion strain energy theory of yielding. 10M

UNIT–II

3. a) An automobile leaf spring is subjected to cyclic stress such that the average stress is 150Mpa, variable stress is 350Mpa; the material properties are; ultimate strength = 400Mpa; yield strength=350Mpa; endurance limit=270Mpa; estimate the factor of safety using Goodman method and Soderberg method? 7M

   b) Discuss the design procedure for the components subjected to completely reversed fluctuating stresses with respect to finite life. 7M

OR

4. a) Define endurance limit? Discuss the factors which affect the endurance limit of the material. 7M

   b) What is stress concentration? Give two examples with sketches how to minimize the stress concentration. 7M

UNIT–III

5. a) Explain basic types of screw fastenings. 6M

   b) A bracket for supporting the travelling crane is shown in Fig. 2. The bracket is fixed to the steel column by means of four identical bolts, two at A and two at B. The maximum load that comes on the bracket is 5 KN acting vertically downward at a distance of 250 mm from the face of the column. The bolts are made of steel 40C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 5. Determine the major diameter of the bolts on the basis of maximum principal stress.

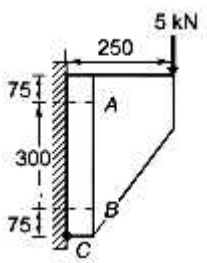

Fig. 2 8M

OR

6. a) What is the cause of residual stresses in welded joints? How are they relieved? 4M

   b) A plate, 75 mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds, as shown in Fig. 3. The joint is subjected to a maximum tensile force of 55 kN. The permissible tensile and shear stresses in the weld material are 70 and 50 N/mm^2 respectively. Determine the required length of each parallel fillet weld.

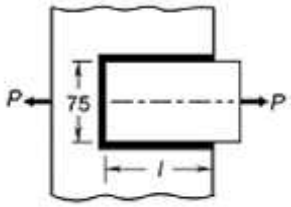

Fig.3. 6M

   c) A 50 mm diameter solid shaft is to be welded to a plate by means of a fillet weld, around the circumference of the shaft. Determine the size of the weld, if the shaft is subjected to a torque of 4 kN-m. The allowable shear stress in the weld is 45 MPa. 4M

UNIT–IV

7. a) A 10kW power is transmitted at 800 rpm, from a motor shaft, through a key, to a machine shaft by a means of a pulley and a belt. Design the key. Take the allowable shear stress and crushing stress are 45MPa and 100Mpa. 6M

   b) Sketch and explain the design procedure for a Cotter joint with Gib. 8M

OR

8. a) What are the functions of key? Classify the keys. 4M

   b) Two mild steel rods are connected by a knuckle joint to transmit an axial load of 150 KN. Design the joint completely. Assume the working stresses for both the pin and rod material as 80 MPa in tension, 68 MPa in shear and 160 MPa in crushing. 10M

UNIT–V

9. a) What is torsional rigidity of a shaft? How is a shaft designed for torsional rigidity? 4M

   b) A shaft transmits 9 kW at 1200 rpm and at the same time is subjected to a bending moment of 1.8 KN-m. Determine the diameter of a solid shaft limiting the shear stress to 60 MPa. What is the % saving in material if it is replaced by a hollow shaft of the same material with diameters ratio of 2? 10M

OR

10. a) What are the advantages of flexible couplings? 2M

    b) Design a Cast Iron flange coupling for a steel shaft transmitting 15 KW at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25 % greater than the full load torque. The shear stress for Cast Iron is 14MPa. 12M

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III B.Tech. I Semester Supplementary Examinations November 2018

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) What is thermal diffusivity? Explain its importance in heat conduction problem. 5M

   b) The thermal conductivity of a material varies linearly with temperature. Derive the one dimensional steady state heat conduction equation with internal heat generation by writing the energy balance for a differential volume element in Cartesian coordinate system. 9M

OR

2. a) Describe different types of boundary conditions applied to heat conduction problems. 5M

   b) Derive the mathematical formulation for 1-D steady state conduction through a slab of length L whose one surface is insulated and the other maintained at a temperature T_1 is exchanging heat by radiation to the ambient at a temperature T_2. 9M

UNIT–II

3. A steam pipe is covered with two layers of insulation, the first layer being 3 cm thick and the second 5 cm. The pipe is made of steel (k = 58 W/mk) having an ID 160 mm and OD of 170 mm. The inside and outside film coefficients are 30 and 5.8 W/m^2K respectively. Calculate the heat lost per meter of pipe if the steam temperature is 300^OC and the air temperature is 50^OC. The thermal conductivity of two insulating materials are 0.17 and 0.093 W/mK respectively. 14M

OR

4. A solid steel ball, initially at temperature T_0, is heated in a controlled environment in such a manner that $T_e = T_0 + 10t$ where T_e is the environmental temperature. Derive an expression for the temperature of the steel ball as a function of the convective heat transfer coefficient and time assuming negligible internal resistance. 14M

UNIT–III

5. a) Why is an analytical solution of a free convection heat transfer problem more difficult than that of a forced convection problem? 5M

   b) An instant water heater consists of a 4 mm ID tube through which water flows at the rate of 3.6 kg/hr at a temperature of 25^OC. A nichrome heating element wound over the tube provides a constant heat flux of 200 W per meter length into the water. Find the length of the tube to raise the temperature to 75^OC and also the maximum temperature at the exit. 9M

OR

6. a) Compare the variations of velocity, temperature and local heat transfer coefficient along a vertical plate which is under natural convection and forced convection. 5M

   b) Water flows through a tube of 60 mm diameter at $20^{O}C$ and leaves at $80^{O}C$. If the tube receives heat at a rate of 2000 W/m^2 at the surface, determine the surface temperature at the outlet of the tube and the length of the tube for a flow rate of 0.01 kg/s. 9M

UNIT–IV

7. a) Distinguish between filmwise and dropwise condensation. Which of these gives a higher heat transfer coefficient and why? 5M

   b) A net radiation from the surfaces of two parallel plates maintained at temperatures T_1 and T_2 is to be reduced by 79 times. Calculate the number of screens or shields to be placed in between the two surfaces to achieve this reduction in heat exchange, assuming the emissivity of screens as 0.05 and that of the surfaces as 0.8. 9M

OR

8. a) Describe in detail the process of nucleate boiling and give one form of equation frequently used. 5M

   b) Silica glass transmits 92% of incident radiation in the wavelength range between 0.35 and 2.7 micrometer and is opaque at longer and shorter wavelengths. Estimate the percentage of solar radiation that the glass will transmit. The Sun can be assumed to radiate as a black body at 5800 K. (Please provide the Black body radiation functions Chart) 9M

UNIT–V

9. Water enters a counter flow double pipe heat exchanger at $15^{O}C$, flowing at the rate of 1300 kg/hr. It is heated by oil (C_P = 2000 J/kgK)flowing at the rate of 550 kg/hr from the inlet temperature of $94^{O}C$. For an area of 1 m^2 and an overall heat transfer coefficient of 1075 W/m^2K, determine the total heat transfer and the outlet temperature of water and oil. Effectiveness = {1–exp[-N(1-C)]}/{1-C exp[-N(1-C)]}, where C is the heat capacity ratio. 14M

OR

10. a) A counter flow double tube heat exchanger is used to cool engine oil (C_P = 2130 J/kgK) from $160^{O}C$ to $60^{O}C$ with water available at $25^{O}C$ as the cooling medium. The flow rate of the cooling water through the inner tube of 0.5 m dia is 2 kg/s while the flow rate of oil through the outer annulus OD = 0.7 m is also 2 kg/s. If the value of the overall heat transfer coefficient is 250 W/m^2K, how long should be the heat exchanger? 10M

    b) Why it is considered, for most of the cases, Counter flow heat exchanger is more effective than parallel flow heat exchanger. 4M

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Hall Ticket Number :										

Code: 4GA51

R-14

III B.Tech. I Semester Supplementary Examinations November 2018

Managerial Economics and Financial Analysis

(Common to CE, ME & 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. Define Price elasticity, Income elasticity and Cross price elasticity of demand. What are the different methods of measuring Price Elasticity of demand? Derive relationship between Price Elasticity of Demand and Marginal Revenue?

OR

2. Define Managerial Economics. Discuss the nature and scope of Managerial Economics. What is the relationship of Managerial Economics with Microeconomics?

UNIT-II

3. What is the shape of long-run average cost curve and explain why? Differentiate between Economies of Scale and Economies of Scope with suitable examples.

OR

4. Define and show graphically the Break even point of a firm. Find out the break even output (Q*) of a firm if total cost (TC) = Rs. 6310; total revenue (TR) = Rs. 4130; fixed cost (FC) = Rs. 4980; variable cost (VC) = Rs. 1330 and present output (Q) = 5.

UNIT-III

5. Compare and Contrast the Short-run and Long-run equilibrium conditions under Perfect competition and Monopoly market.

OR

6. Define Oligopoly market structure. Describe how price and output is determined under Stackelberg Duopoly model.

UNIT-IV

7. Why is capital important for a firm? What are the various sources of raising capital? Elaborate.

OR

8. What is capital budgeting? Define Net Present Value and Discount Rate. Write a brief note on Pay Back Method.

UNIT-V

9. What do you understand by the term ‘Ledger’ and ‘Trial Balance’? Name two methods of preparing a Trial Balance. Prepare a purchase book from the following information:
   a) Purchase of goods costing Rs. 5000/- from M/s Ramesh & Co. vide invoice no. 120 dated 15/09/2017.
   b) Purchase of Fixed Assets costing Rs. 8000/- from M/s Renu & Co. vide invoice no. 016 dated 20/09/2017.
   c) Paid wages of Rs. 600/- in cash vide receipt no.16 dated 25/09/2017.

OR

10. What is the meaning of Accounting Ratios? What are the objectives of ratio analysis? List out the advantages and limitations of ratio analysis.

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