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SET-1

B.Tech III-I Semester Examinations,
DESIGN OF MACHINE ELEMENTS
(AUTOMOBILE ENGINEERING)

Time: 3 hours   Max. Marks: 80
Answer any five questions
All questions carry equal marks

1.a) Explain the procedure of selecting and evaluating engineering components subjected to dynamic loads.
  b) Discuss the systems of fits. Why the shaft basis system is preferred to hole basis system?   [8+8]

2.a) Differentiate between failure stress, design stress, and working stress.
  b) Determine the maximum stress produced in a rectangular plate 50 mm wide, and 8 mm thick with a central hole of 10 mm diameter. It is loaded in an axial tension of 1 kN.   [8+8]

3.a) What do you understand by Stress Concentration? Define and differentiate between form stress factor and stress concentration factor.
  b) Write the Solderberg equation and explain how it is used for a ductile material under simple bending loading condition.   [8+8]

4. Design and make dimensioned sketches for a triple riveted butt joint suitable for a 3 m diameter steam generator having a working pressure of 1.4 MPa gauge. The joint is to be for the longitudinal seams of the generator, and the permissible stresses in tension and shear are 83 and 74 MPa respectively. The efficiency of the joint should not be less than 85%.   [16]

5.a) Discuss the shortcomings of a cotter joint. What are the advantages which make the use of cotter joint inspite of its short comings?
  b) A shaft of 30 mm diameter is transmitting power at a maximum shear stress of 80 MPa. If a pulley is connected to the shaft by means of a key, find the dimensions of the key so that the stress in the key is not to exceed 50 MPa and the length of the key is 4 times the width.   [8+8]

6.a) What is the function of a circlip? Distinguish between external and internal circlips, with suitable sketches.
  b) A machine propeller shaft is 0.15 m in diameter, and is subjected to a thrust of 68 kN and a torque of 22.5 kNm. Determine the maximum compressive and shear stress induced.   [8+8]

7.   Design and give a dimensioned sketch of a rigid flange coupling for the following specifications: Diameter of the shafts to be connected = 50 mm; Number of machined bolts fitted to reamed holes = 4; Pitch circle diameter of bolts = 150 mm; The material for the bolts and the shafts is the same, and has an ultimate strength of 525 MN/m^2 with yield point in tension of 315 MN/m^2. The size of the bolts should be such as to have the same capacity as the shaft in torsion. Assume that the bolts are "finger tight", and the shear stress is uniformly distributed in the shank of bolts under load.   [16]

8.   Write short notes on:
     a) Endurance limit
     b) Design of joints under eccentric loading
     c) Preferred numbers   [5+6+5]

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