Hall Ticket No | | | | | | | | | | | Question Paper Code: AME012

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations(Regular) - November, 2019

Regulation: IARE – R16

DESIGN OF MACHINE MEMBERS

Time: 3 Hours **(ME)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain the procedure of determining endurance limit with neat diagram. **[7M]**

   (b) A Shaft of diameter d is subjected to a torque varying between 100 N.m to 500 N.m . Kt due to keyway is 1.5. F.S = 2, S_y = 300 MPa, Se = 200 MPa Correction factor for torsion=0.6.Surface finish factor=0.85 and size factor = 0.82. Find the value of d. **[7M]**

2. (a) What are the various types of variable stresses and draw stress vs time curve for each one of them. **[7M]**

   (b) A cylindrical shaft made of steel of 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 the shaft using maximum shear stress theory and strain energy theory. Assume a factor of safety of 2. Take E = 210 GPa and poisson's ratio = 0.25. **[7M]**

UNIT – II

3. (a) Explain basic types of screw fastening. Why are V threads used for fastening. **[7M]**

   (b) A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets. **[7M]**

4. (a) List out advantages and disadvantages of welded joints over riveted joints. **[7M]**

   (b) A bracket is fitted to the channel with 4 bolts. The dimension a=b=150mm distance of load from the C.G of the bolt arrangement is 300mm. Find the diameter of the bolts. **[7M]**

UNIT – III

5. (a) Describe the design procedure of a gib and cotter joint. What are the applications of a cotter joint? **[7M]**

   (b) Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa; shear stress = 35 MPa and crushing stress = 90 MPa. **[7M]**

6. (a) How are the keys classified? Draw neat sketches of different keys and their applications. **[7M]**

   (b) Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa. **[7M]**

UNIT – IV

7. (a) How is the shaft designed when it is subjected to twisting moment only? **[7M]**

   (b) A steel spindle transmits 4 kW at 800 r.p.m. The angular deflection should not exceed 0.25^0per metre of the spindle. If the modulus of rigidity for the material of the spindle 84GPa. Find the diameter of the spindle. **[7M]**

8. (a) List out why couplings are used and what are the basic requirements for it. **[7M]**

   (b) Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa. **[7M]**

UNIT – V

9. (a) Define spring. Explain functions of spring Explain type of springs. **[7M]**

   (b) A helical coil spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm, find the axial load which the spring can carry and the deflection per active turn. **[7M]**

10. (a) Discuss about stress and deflection in helical springs of non-circular wire. **[7M]**

    (b) A railway wagon of mass 20000 kg moving with a velocity of 2 m/s is brought to rest by two buffers of a spring of diameter 300 mm. The maximum deflection of the spring is 200 mm. permissible shear stress is 600 MPa. Find the dimensions of each spring. **[7M]**