Code No: **R31035**   **R10**   Set No. 1

III B.Tech I Semester Supplementary Examinations, November - 2015
DESIGN OF MACHINE MEMBERS-I
(Mechanical Engineering)

Time: 3 hours   **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 a) What are the basic requirements of machine element? [7]

   b) The piston of a reciprocating compressor has a diameter of 60 mm. The maximum pressure on the piston face is 1.25 MN/m^2 (12.5 bar). Assuming that the gudgeon pin passing through the small end of the connecting rod can be safely loaded in shear up to 10 MN/m^2. Calculate the minimum diameter of the gudgeon pin. [8]

2 A hot rolled 070M26 steel rod is to be subjected to a torsional load that will vary from -110 N m to 440 N m. Determine the required diameter of the rod using a factor of safety N = 1.75. [15]

3 A boiler shell 240 cm in diameter is subjected to a steam pressure of 10 kg/cm^2. It has a treble riveted butt joint and double riveted circumferential lap joint with efficiency of 85% and 70% respectively. The allowable stresses may be taken as σ_t = 770 kg/cm^2, σ_{cr} = 1,200 kg/cm^2 and σ_s = 560 kg/cm^2.
Resistance of rivets in double shear equals to 1.875 times that of rivets in single shear. The joint should be steam and water light. [15]

4 A steel bracket is secured to the wall by means of four through bolts made of C.40 steel having allowable tensile stress of 800 kg/cm^2. The rotating shaft, fitted in a bearing on the bracket, exerts a load of 2,000 kg at a distance of 15cm from the wall. Find the required size of the bolts to be used. [15]

(All dimensions in cm)
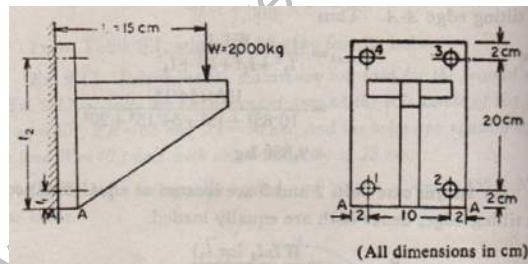
5 Describe a knuckle joint to connect two mild steel bars under a tensile load of 25 kN. The allowable stresses are 65 MPa in tension, 50 MPa in shear and 83 MPa in crushing. [15]

6 Compare the torsional stiffness and strength of a solid circular section shaft with a solid elliptical section having a semi major axis twice the semi minor axis let both torsion members be made of the same material and have the same length and the same cross sectional area. [15]

7 Design a flexible coupling with rubber bushes as flexible members, suitable to transmit 400 h.p. at 1450 rpm. The maximum torque may rise to 1.5 times the steady torque. The outside diameter of the coupling is 35 cm. Assume reasonable stresses for the parts of the coupling, make a neat sketch of the coupling. [15]

8 A helical spring B is placed inside the coils of a second helical spring A, having the same number of coils and free length. The springs are made of the same material the composite spring is compressed by an axial load of 2300 N which is shared between them. The mean diameters of the spring A and B are 100 mm and 70 mm respectively and wire diameters are 13 mm and 8 mm respectively. Find the load taken and the maximum stress in each spring [15]

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