[03 – 2114]

II/IV B.E. DEGREE EXAMINATION.

First Semester

Mechanical Engineering

MACHINE DRAWING

(Common with Dual Degree program in Mechanical Engineering)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Answer ALL questions.

1. Sketch the following with proportionate dimensions. $(3 \times 5 = 15)$

   (a) Flange coupling

   (b) Gib-head Key

   (c) Splined shaft

   (d) Wing nut

   (e) Set screw

   (f) Conical head Rivet.

2. Draw the Knuckle Joint for connecting two 25 mm diameter shafts. (10)

3. Draw the top view of double riveted lap joint (Chain type) for connecting two plates of thickness 9 mm. Use relevant empirical relations and show least 3 rivet heads along each row of rivets. (10)

4. Figure below shows the pictorial view of a FOOT STEP BEARING. Draw to a conventional scale the following:

   (a) Full sectional front view

   (b) Top View. (15)

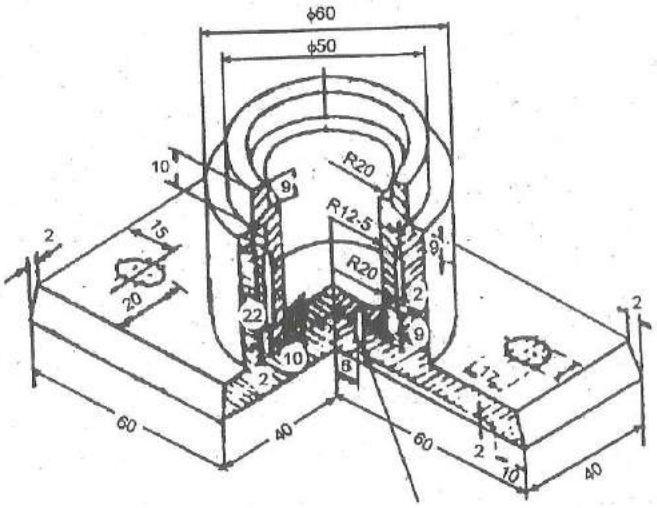

Figure.1

5. Figure 2 shows the details of Universal Coupling Assemble the given parts and draw the front view of assembly. (20)

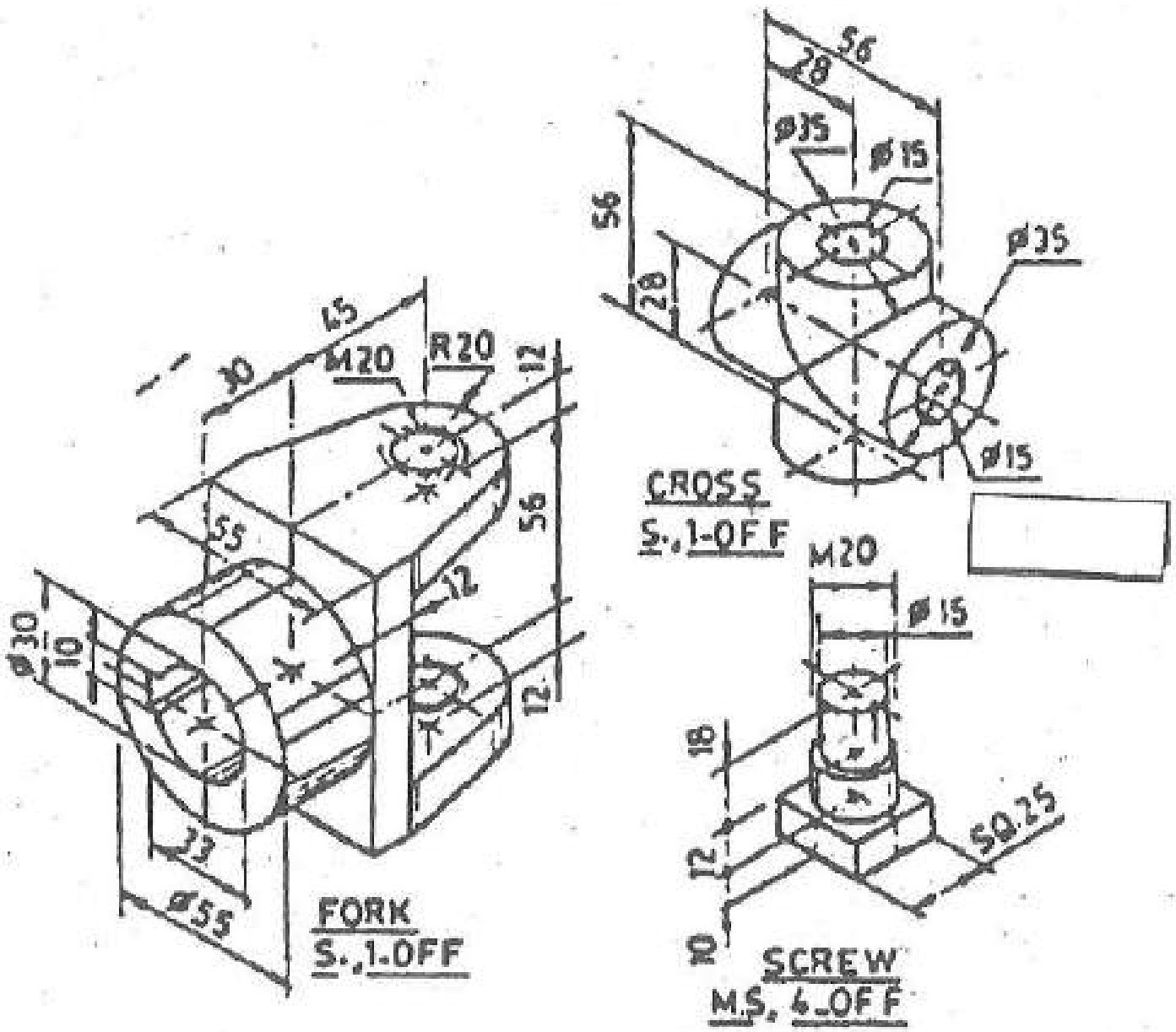

Figure.2

4. A beam ABCDE is simply supported at A and E, carries a uniformly distributed load of 4 kN/m over BC and a concentrated load of 8 kN at D. AB = BC = CD = DE 2m. If E = 200 Gpa and I = 20460000 mm^4, determine the deflections and slopes at B, C and D. Use moment area method. (14)

5. (a) A compression spring made of alloy steel of coil diameter 75 mm and spring index 6, number of active coils 20 is subjected to a load of 1.25 kN. Calculate

   (i) the maximum stress developed in the coil

   (ii) the deflection produced and

   (iii) the spring rate. (6)

   (b) A steel tube having outside and inside diameters of 40 mm and 35 mm is firmly plugged at both ends, leaving internal length of 200 mm between the flat ends of the plugs. The plugs are so designed that water can be admitted to the inner space and also that an axial pull can be applied to the tube. If the tube is subjected to an axial pull of 20 kN and in addition is filled with water at a gauge pressure of 2 MPa, find the volume of water which will escape from the tube if the axial load is removed and the inner space opened to the atmosphere. K for water = 2.1 GPa, E for steel = 210 GPa and v = 0.28. (8)

6. (a) Compare the resisting moments of two beams of the same material, one having the soil circular section and the other a hollow circular section with an outside diameter equal to twice the internal diameter if the weight per unit length of the two beams is same. (7)

(b) A solid circular shaft of diameter 45 mm is loaded by bending moment 650 Nm and torque 900 Nm. The shaft material is ductile with yield strength of 280 MPa. Determine the factor of safety according to Tresca and Von Mises theory of failure. (7)

7. (a) A shaft has to transmit a torque of 15 kNrn. Compare the weights of the shaft per unit length when it has a solid circular section and when it is a hollow circular section with an inner diameter that is 80 percent of the outer diameter. Assume that the allowable shear stress is 70 MPa. (7)

(b) A propeller shaft of 200 mm external diameter and 100 mm internal diameter has to transmit 1350 kW power at 80 rpm. In addition, it is subjected to a bending moment of 10 kNm and an end thrust of 100 kN. Find

(i) the principal stresses and

(ii) the maximum shear stress and its plane. (7)

8. Prepare the shear force and tending moment in diagrams for the beam loaded as shown in figure below. (14)