BAS-010

00033

B.TECH. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2012

BAS-010 : MACHINE DESIGN

Time : 3 Hours | Maximum Marks : 70

Note : Attempt any seven questions. Assume missing data if any. Use of calculator is permitted. Use of machine design data book is permitted.

1. (a) Why are metals in their pure form unsuitable   5
        for industrial use ?

    (b) What are the reasons for the use of alloy   5
        steels in machine parts ?

2. (a) Define and differentiate between modulus   7
        of elasticity and modulus of rigidity.

    (b) What type of stress is produced because of   3
        centrifugal force ?

3. Define : Tolerance, Allowance, Low limit of size,   10
    High limit of size, Unilateral system tolerance,
    bilateral system tolerance, Deviation, fundamental
    deviation, zero line, Tolerance zone.

4. A single riveted lap joint is to be made of 10 mm plate. Find the diameter of rivets, their pitch and the efficiency of the joint. Take shearing stress $= 64.0$ N/mm^2, tensile stress $= 80.0$ N/mm^2 and so design the joint that its strength to with stand shear of rivets equals its strength to withstand tearing of the plate across the line of the rivet holes. **10**

5. An I-beam is welded all around as shown in fig.1. Determine the stresses in the fillets of weld for load $P = 100$ kN. Height of beam 252 mm, length of beam $= 150$ mm, Leg of the weld $= 6$ mm, flange width $= 180$ mm. Thickness of flange and web $= 6$ mm. **10**
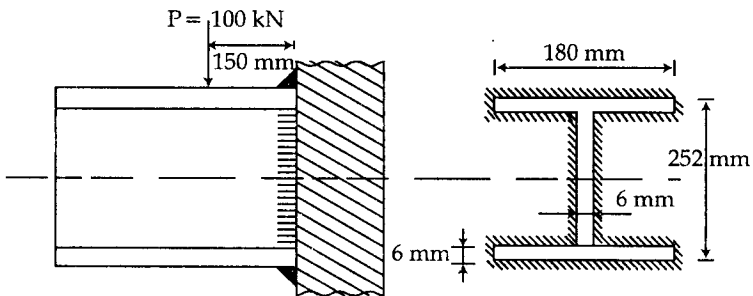

Fig. 1

6. What forces will be required at a radius of 80 mm 10 to raise and lower a 11 kN cross bar of a planer ? The bar is raised and lowered by two 38 mm square thread screws, having a pitch of 7 mm. The screw is of steel and nut is of bronze 38 mm thick. The collar is of steel and it has an outside diameter of 76 mm and inside diameter of 38 mm. Assume the coefficient of friction at the threads as 0.11, at the collar as 0.13.

7. A spring is made from a wire of 1.25 mm diameter 10 and 750 N/mm^2 as its yield strength. For a mean diameter of 12.5 mm and 14 active coils of the spring, determine (a) static load corresponding to the yield point of the material and deflection corresponding to that, (b) solid height assuming that the ends are squared and ground, (c) stiffness of spring, (d) pitch of the wire so that the solid stress will not exceed the yield point. Take modulus of rigidity = 0.85 × 10^5 N/mm^2.

8. Find out the diameter of cast iron pulleys and the 10 thickness and width of a leather belt to transmit 128.7 kW power from a shaft that is directly connected to a steam engine running at 31.4 rad/s, to a centrifugal pump with a speed ratio of 1 : 3.5. Speed 20 m/s, slip 2%, service factor 1.2, coefficient of friction between leather and CI pulley 0.35, working stress 3.5 N/mm^2, efficiency of wire laced by machine is 0.9.

BAS-010 3 P.T.O.

9. (a) What are the design requirements of a clutch ? 5

(b) What are the various types of brakes ? 5

10. (a) What are the various shaft materials ? 5

(b) What effect has a keyway on the torsional rigidity of a shaft ? 5

———————