B.Tech Degree VI Semester Examination in Marine Engineering   July 2010

MRE 606 MACHINE DESIGN AND DRAWING

Time : 3 Hours   Maximum Marks : 100

I.   (a)   Explain what is meant by clearance fit, interference fit and transition fit with suitable
            sketches.   (10)
      (b)   Explain the following heat treatment processes –
            (i)   Annealing
            (ii)   Hardening
            (iii) Tempering   (10)

OR

II.   (a)   What is meant by standardization and interchangeability? Discuss their importance.   (10)
      (b)   A 75 mm shaft rotates in a bearing.   The tolerance for both shaft and bearing is
            0.075 mm and the required clearance is 0.1 mm. Determine the dimensions of
            the shaft and the bearing with the basic hole standard.   (10)

III. (a)   How does a designer take care of stress concentration in a design? Briefly explain the
            stress concentration factor under different types of loading conditions.   (10)
      (b)   What is meant by endurance limit of a material? How is it expressed? What are the
            factors affecting the endurance limit of a material?   (10)

OR

IV.   (a)   The stress at a point in a body are $\sigma_x = 91 MN / m^2$, $\sigma_y = 21 MN / m^2$,

            $\tau_{xy} = 84 MN / m^2$. The yield point stress of the material is $280 MN / m^2$. Find the

            factor of safety based on -
            (i)   Maximum principal stress theory
            (ii)   Maximum shear stress theory   (10)
      (b)   Determine the maximum stress produced in a stepped shaft of diameters 40 mm and
            30 mm with a fillet radius of 6 mm, when it is subjected to a torque of 100 Nm.   (10)

V.   Design a double riveted butt joint with two cover plates for the longitudinal seam of a
            boiler shell 0.75m in diameter to carry a maximum steam pressure of 1.05 N/mm^2 .   (20)

OR

VI.   An I – beam is welded all around as shown. Determine the stresses in the fillet weld for
            a load P = 100 kN. Leg of the weld = 6mm.

(20)
(P.T.O)
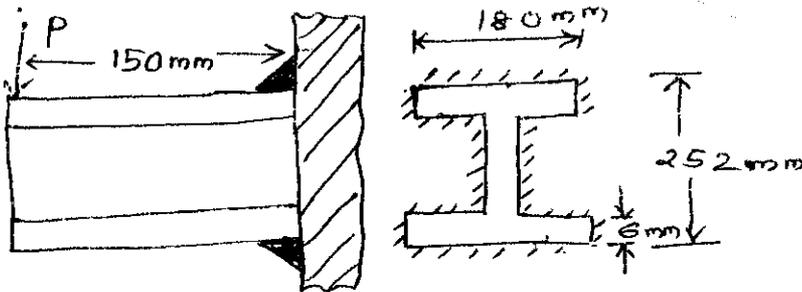
VII.   A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15m and the load on it is 40 kN. The speed of the pump is 900 rev/min. Make a complete design of the bearing.   (20)

OR

VIII.   Design completely a flat belt drive to drive a winch from an electric motor of 11 KW power rotating at 750 rpm. The speed ratio is 4. Assume there is considerable variation of load.   (20)

IX.   A compressor running at 300 rpm is driven by a 15KW, 1200 rpm motor through 20^0 full depth spur gears. The centre distance is 0.375m. The motor pinion is to be of C – 30 forged steel hardened and tempered and the driven gear is to be of cast steel. Assuming medium shock condition, design the drive completely.   (20)

OR

X.   Design a bevel gear drive between two shafts whose axes are at right angles. Speed of the pinion is 240 rpm and that of gear is 120 rpm. Pinion is to have 21 teeth of involute profile with module 20 mm and pressure angle 20^0. Power at gear shaft is 75 KW.   (20)

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