B. Tech. Degree VI Semester Examination in Marine Engineering June 2013

MRE 606 MACHINE DESIGN AND DRAWING

Time : 3 Hours   Maximum Marks : 100

I. (a) Enumerate the different factors which affect design. (5)
    (b) Briefly discuss the term design synthesis. (5)
    (c) Discuss the factors to be considered in design for economy. (5)
    (d) What are the important properties of material to be considered? (5)

OR

II. (a) What are the common manufacturing consideration in design? (5)
    (b) Is it possible to prevent wear? Explain. (5)
    (c) The stresses induced in a machine member are as follows. A tensile stress of 100MPa (10)
        in x direction, a tensile stress of 40MPa perpendicular to x direction and a shear stress
        of 80MPa. Calculate the factor of safety by any two theories of failure. Yield strength
        in tension = 380MPa.

III. (a) What are the points to be considered while designing machine elements subjected to (5)
         impact loads?
     (b) A 10mm thick plate is subjected to a tensile load varying from 50kN to 150kN. The (15)
         material of the plate has yield strength of 450MPa and endurance strength of 150MPa.
         It is drilled with a hole with a diameter equal to one-fifth of the width. Using a factor
         of safety of 2 and stress concentration factor of 1.75, determine the width required for
         the plate.

OR

IV. (a) What are the factors which affect the fatigue strength? (5)
    (b) A hot rolled circular shaft made of steel Fe620 is subjected to an alternating torsional (15)
        moment which varies from –200 Nm to +400Nm. Neglecting stress concentration
        calculate the diameter of the shaft for infinite life if the factor of safety = 2.

V. (a) Why tolerances are required on mating parts? (5)
    (b) Design a cotter joint for transmitting a tensile or compressive load of 20kN. The (15)
        allowable stresses are 60, 90 and 45 N/mm^2 in tension, compression and shear
        respectively.

OR

VI. (a) What are the advantages of riveted joint? (5)
    (b) A welded connection of steel plates shown in the figure is subjected to an eccentric (15)
        load of 10kN. Design the weld if the permissible shear stress is limited to 80N/mm^2.

10 kN
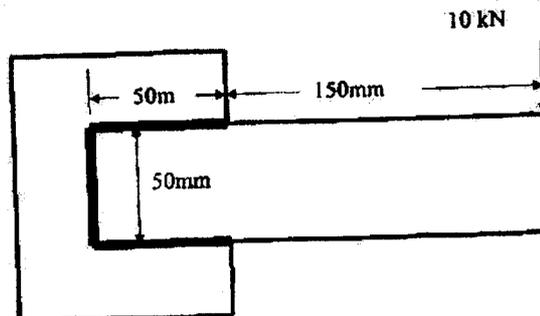
VII. (a) What are the important requirements of a friction clutch? (5)

(b) How are the brakes rated an classified? (5)

(c) A flat belt drive transmits 18kW from a 150mm diameter pulley running at 1000rpm to another pulley of diameter 420mm. The coefficient of friction is 0.3 and the centre distance is 240cm. It is proposed to increase the power transmission capacity of the drive. Which of the following is more effective, increase the initial tension by 10% or increase in coefficient of friction by 10%? (10)

OR

VIII. (a) Compare belt and chain drives. (5)

(b) Differentiate between a shaft and an axle. (5)

(c) Select a suitable bearing to operate at 1500rpm, radial load = 8000N, axial load = 5000N, diameter = 45mm and life = 500hrs. (10)

IX. A spur gear with pitch circle diameter of pinion and gear 150 and 450mm respectively transmits 5kW at 900rpm. The pinion is made of 40C8 steel and the gear is made of cast iron. Taking pressure angle of 20 deg involute type design the gear from strength, wear and dynamic load consideration. (20)

OR

X. A speed reducer is designed for centre distance of 200mm and the transmission ratio of 10. The speed of the worm is 175rpm. The gear is made of phosphor bronze with 20 deg involute profile and the worm is made of cast iron. Design the gear. Estimate the power rating of the gear. Allowable strength for phosphor bronze is 5.5 MPa. (20)

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