BT–MRE VI(S) – 06.16 –0822 Reg. No. | | | | | | | | |

D

B.Tech. Degree VI Semester Supplementary Examination in Marine Engineering June 2016

MRE 606 MACHINE DESIGN AND DRAWING

Time : 3 Hours Maximum Marks : 100

(5 × 20 = 100)

I. (a) Discuss the term machine design with suitable examples. (10)
(b) Discuss the manufacturing considerations in the design process. (10)

OR

II. (a) Briefly discuss different mechanical properties of engineering material. (7)
(b) Distinguish between design synthesis and design analysis. (8)
(c) Explain the causes for wear and method to minimize it. (5)

III. (a) What are the effects of stress concentration in ductile and brittle components when subjected to static and fluctuating loads? (6)
(b) A stepped shaft with diameter ratio 1.2 has a fillet radius of 0.1d is required to transmit 60 kW at 1200 rpm. The shaft is made of C40 steel. Taking factor of safety 2.5, determine the diameters of the shaft. (14)

OR

IV. A cold rolled solid circular shaft made of steel is subjected to a varying axial load of 4 kN to 10 kN and a bending moment which varies from 540 Nm to 1080 Nm. Neglecting stress concentration, calculate the diameter of the shaft for infinite life if the factor of safety = 2, Tensile strength = 570 MPa and yield strength = 420 MPa. (20)

V. (a) What are the guidelines for selection of fits? (5)
(b) The tolerances for a shaft and bearing are $H8_g7$. If the nominal size of the shaft is 50 mm, determine the size of dimensions of shaft and bearing. (5)
(c) A shaft is required to transmit 16 kW at 500 rpm. Select a suitable key of rectangular cross section if the hub length is 60 mm. Take allowable and crushing stresses for material used as 70 MPa and 140 MPa respectively. (10)

OR

VI. (a) Compare the principle of operation of flexible coupling with rigid coupling. (5)
(b) Show the failure modes of a rivet in a riveted joint. (5)
(c) A circular beam, 50 mm in diameter is welded to a support by means of a annular fillet weld. A load of 10 kN is acting at the free end of the beam and is acting 200 mm from the support. Determine the size of the weld, if the permissible shear stress in the weld is limited to 100 N/mm^2. (10)

VII. (a) Select a suitable ball bearing required to be mounted on the shaft of diameter 45 mm to withstand a radial load of 6 kN and a thrust load of 3 kN at a rated speed of 300 rpm. The bearing works for 50 hours per week for 3 years. Assume light shocks. (8)
(b) A section of commercial shaft 2 m long between bearings carries a 900 N pulley at its midpoint. The shaft transmits 20 kW at 300 rpm. The belt drive is horizontal and the sum of the belt tension is 6 kN. Find the diameter of the shaft. (12)

OR

(P.T.O.)

VIII. (a) Design a single plate clutch to transmit a torque of 300 Nm. The outside diameter of the lining is 300 mm. Coefficient of friction is 0.3 and the allowable pressure is 0.18 MPa. Assume both sides of the plate as effective. (9)

(b) What is meant by a self energizing brake? How does it tend to be self locking and how should this be avoided? (6)

(c) What are the desirable properties of belt material? (5)

IX. Design a pair of helical gears to transmit 18 kW power at a speed reduction ratio of 5:1. The input shaft rotates at 4000 rpm. The helix angle is not to be greater than 30 degree. The teeth are 20 degree stub involute in diametral plane. Assume cast steel as the material for both the gears. (20)

OR

X. Design a worm gear speed reducer for an input power of 2 kW at a worm speed of 2000 rpm. The transmission ratio is 25. The tooth form is 14½ degree and the centre distance is 120 mm. Check for heat balance and also determine the efficiency. (20)

***