BT–MRE –VI– 05.17-0702 Reg. No. | | | | | | | | |

B

B.Tech. Degree VI Semester Examination in Marine Engineering May 2017

MRE 1606 MACHINE DESIGN AND DRAWING

(2013 Scheme)

Time : 3 Hours Maximum Marks : 100

(5 × 20 = 100)

I. (a) Recommend suitable materials for the following components giving reasons (7)
   (i) Connecting rod.
   (ii) Machine tool spindle.

(b) What do you understand by the following designation of materials? (7)
   (i) Fe 360.
   (ii) Fe E 250.

(c) State the merits and demerits of cast iron as an engineering material. (6)

OR

II. (a) Briefly explain design synthesis. (6)

(b) Describe major heat treatment process of steels. (14)

III. (a) Illustrate how the stress concentration in a component can be reduced. (6)

(b) Explain how the factor of safety is determined under steady and varying loading by different methods. (7)

(c) A stepped shaft has maximum diameter 45 mm and minimum diameter 30 mm. The fillet radius is 6 mm. If the shaft is subjected to an axial load of 10 kN, find the maximum stress induced, taking stress concentration into account. (7)

OR

IV. (a) Write note on cyclic and combined loads. (6)

(b) A steel connecting rod is subjected to a completely reversed axial load of 160 kN. Suggest the suitable diameter of the rod using a factor of safety 2. The ultimate tensile strength of the material is 1100 MPa and yield strength 930 MPa. Neglect column action and the effect of stress concentration. (14)

V. (a) Distinguish between cotter joint and knuckle joint. (5)

(b) Show by neat sketches the various ways in which a riveted joint may fail. (7)

(c) A 125 × 95 ×10 mm angle is joined to a frame by two parallel fillet welds along the edges of 150 mm leg. The angle is subjected to a tensile load of 180 kN. Find the lengths of weld if the permissible static load per mm weld length is 430 N. (8)

OR

VI. (a) Describe with neat sketches, the types of various shaft couplings mentioning the use of each type. (10)

(b) A marine type flange coupling is used to transmit 3.75MW at 150 rpm. The allowable shear stress in the shaft and bolts may be taken as 50 MPa. Determine the shaft diameter and the diameter of the bolts. (10)

(P.T.O.)

VII. (a) It is stated that the speed at which a belt should be run to transmit maximum power is that at which the maximum allowable tension is three times the centrifugal tension in the belt at that speed. Prove the statement. (10)

(b) Find the width of the belt necessary to transmit 10 kW to a pulley 300 mm diameter, if the pulley makes 1600 rpm and the coefficient of friction between the belt and the pulley is 0.22. Assume angle of contact is 210° and the maximum tension in the belt is not to exceed 8 N/mm width. (10)

OR

VIII. (a) Write the design procedure for a chain drive. (6)

(b) Design a chain drive to run a blower at 600 rpm. The power to the blower is available from a 8 kW motor at 1500 rpm. The centre distance is to be kept at 800 mm. (14)

IX. (a) What condition must be satisfied in order that a pair of spur gears may have a constant velocity ratio? (6)

(b) A bronze spur pinion rotating at 600 rpm drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stress for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16, standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the stand point of strength. (14)

OR

X. (a) Discuss with neat sketches the various types of worms and worm gears. (6)

(b) A speed reducer unit is to be designed for an input of 1.1 kW with a transmission ratio 27. The speed of the hardened steel worm is 1440 rpm. The worm wheel is to be made of phosphor bronze. The tooth form is to be 20° involute. (14)

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