

## ***B. Tech Degree VI Semester Examination in Marine Engineering June 2011***

### **MRE 606 MACHINE DESIGN AND DRAWING**

(Assume missing data if any)  
(use of Design data book is permitted)

Time : 3 Hours

Maximum Marks : 100

- I. (a) What are the various steps for the final design and manufacture of components or a system? (10)  
 (b) What is meant by ductility and malleability? (5)  
 (c) Can corrosion be prevented? Discuss. (5)
- OR**
- II. (a) Enumerate the important properties of engineering materials which would be considered during selection of materials while designing machine parts. (10)  
 (b) How does wear cause failure in a machine? (5)  
 (c) What are the advantages of using preferred sizes of components? (5)
- III. (a) Explain the term stress concentration with reference to designing of machine elements. Propose the methods to reduce the effect of stress concentration. (8)  
 (b) A steel connecting rod is subjected to a completely reversed axial load of 100kN. Suggest the suitable size of rod using a factor of safety=2. (12)  
     Take ultimate strength = 1100 MPa  
     Yield strength = 930 MPa
- OR**
- IV. A hot rolled steel shaft is subjected to a torsional load that varies from 300 Nm clockwise to 100Nm anticlockwise and an applied bending moment which varies from 400 Nm to – 200 Nm. Suggest the suitable size for the shaft. (20)  
 Take ultimate strength = 560 MPa  
 Yield strength = 420 MPa, Factor of safety = 2  
 Design should be based on considering the correction factors for load, size and surface finish. Stress concentration may be neglected.
- V. (a) For a bolted joint the initial tightening load is 12 kN. If the stiffness of the member is three times the stiffness of the bolts, find the load in the bolt and members if the external load is 12 kN. Also calculate at what external load the separation of the members will occur. (6)  
 (b) Design a cotter joint for the transmission of 25 kN load. Allowable stresses are tensile 50 N/mm<sup>2</sup>, compressive 80 N/mm<sup>2</sup> and shear 40 N/mm<sup>2</sup>. (14)
- OR**
- VI. (a) Derive the strength equation of a double parallel fillet weld. (5)  
 (b) A boiler with internal diameter of 2m is subjected to a pressure of 1.75 MPa. Design a longitudinal rivet joint. The straps are of unequal width. The pitch of the rivets in the outer row is to be twice of the pitch in the inner rows. The permissible stresses are 80,60,120 N/mm<sup>2</sup> for tension, compression and shear respectively. (15)
- VII. (a) Explain the following terms as applied to shafts. (6)  
     (i) Equivalent bending moment  
     (ii) Equivalent torsional moment  
 (b) The following data is given for 360° hydrodynamic bearing (14)  
 Radial load = 6 kN, Journal speed = 1260 rpm  
 Journal diameter = 60mm, Bearing length = 60 mm  
 Minimum oil thickness = 0.008mm Radial clearance = 0.04mm  
 Specify the viscosity of the lubricating oil.

**OR**

(P.T.O)

- VIII. (a) What are the applications of flat, V, round and timing belts? (5)  
(b) What are the basic differences between uniform wear theory and uniform pressure theory for friction clutch? (5)  
(c) What is a self-locking and self energizing brake? Which is preferable? (5)  
(d) Differentiate between a shaft and an axle. (5)
- IX. A cast steel pinion rotating at 900rpm is to drive a cast iron gear at 144 rpm. (20)  
The teeth are to be standard  $20^\circ$  stub involute profile and the maximum power to be transmitted is 25 kW.  
Safe static stress for cast steel pinion = 103 MPa  
Safe static stress for cast iron gear = 55 MPa  
Pinion is surface hardened to 250 BHN. Design.
- OR**
- X. Design and determine the input power capacity of a worm gear speed reducer (20)  
unit composed of a hardened steel worm and a phosphor bronze worm wheel having  $20^\circ$  stub involute teeth. The center distance is to be 200mm, the transmission ratio is to be 10 and the worm speed is to be 1450 rpm.