

--	--	--	--	--	--	--	--	--	--



***B.Tech. Degree VI Semester Examination in
Marine Engineering June 2014***

MRE 606 MACHINE DESIGN AND DRAWING

Time: 3 Hours

Maximum Marks: 100

(All questions carry *EQUAL* marks)

(5 x 20 = 100)

- I. (a) Explain the various phases of the design process. (10)
 (b) What are preferred numbers? (5)
 (c) Explain the purpose of heat treatment. (5)
- OR**
- II. (a) What are the main alloying elements in alloy steels? Why are these alloying elements added? (7)
 (b) Discuss any two failure criteria in mechanical design. (8)
 (c) Briefly discuss the terms strength and rigidity. (5)
- III. (a) What are the points to be considered while designing machine elements subjected to cyclic loads? (5)
 (b) A weight of 1.2kN falls from a height of 30mm at the middle of a simply supported beam of circular cross section 1.8m long. The allowable stress for steel used is 120MPa and the modulus of elasticity is 206GPa. Determine the required diameter of the rod. (15)
- OR**
- IV. A cold rolled solid circular shaft made of steel is subjected to an alternating torsional moment which varies from -210Nm to + 420Nm. And at the same time the bending moment on the shaft varies between + 600Nm to -200Nm. Neglecting stress concentration calculate the diameter of the shaft for infinite life if the factor of safety = 2, tensile strength = 500MPa and yeild strength = 360MPa. (20)
- V. (a) What is meant by surface finish? How can it be measured? (6)
 (b) The cylinder head of a steam engine is subjected to a steam pressure of 0.7MPa. It is held by means of 12 bolts. A soft gasket is used to make the joint leak proof. The effective diameter of the cylinder is 300mm. Find the size of the bolt such that the stress on the bolt is not to exceed 100MPa. (14)
- OR**
- VI. (a) What are the advantages of welded joint? (6)
 (b) Design a triple riveted double cover butt joint with unequal cover plates to connect two plates of 20mm thickness. Take tensile strength = 90MPa, shear strength = 60MPa and Compressive strength = 150MPa. (14)

(P.T.O.)

- VII. (a) Explain how clutch differs from brake. (5)
(b) What are the different types of belts used in practice? Discuss their merits and demerits. (5)
(c) A shaft rotating at 300 rpm transmits 20kW. It is supported on bearings at a distance of 3m apart and carries a central load of 2kN. Selecting C40 steel for shaft and factor of safety = 2.5, find the suitable diameter of the shaft. (10)

OR

- VIII. (a) What is polygonal action in chain drive? (5)
(b) Define the following for the bearing, static load capacity and dynamic load capacity. (5)
(c) The following data refers to a full journal bearing. Load = 5000N, speed of the shaft = 300 rpm, diameter of the shaft = 100mm, diametral clearance = 0.1mm, minimum oil thickness = 0.020mm. Viscosity of oil at the temperature of bearing = 12.1×10^{-3} PaS. Find the L/D ratio and the power lost in friction. (10)

- IX. Design a pair of spur gears to transmit 10kW power at a speed reduction ratio of 2:1. The input shaft rotates at 400rpm. The approximate centre distance = 600mm. The teeth have 20 deg full depth involute profile. Assume the gear is made of cast iron FG 200, having allowable strength of 75MPa and 180 BHN core hardness. (20)

OR

- X. Design a worm gear speed reducer to transmit 22.5kW at 1440rpm. The desired speed ratio is 24:1 and efficiency = 85%. Assume that the worm is made of hardened steel and gear of phosphor bronze. (20)
