BT MRE – VI– 10 – 06

B. Tech Degree VI Semester Examination in Marine Engineering, November 2009

MRE 606 MACHINE DESIGN AND DRAWING

Time: 3 Hours Maximum Marks: 100

I. (a) Differentiate between empirical design and rational design. (5)

(b) Discuss the following:
(i) Developed design
(ii) Functional design
(iii) Initial and final design (9)

(c) Draw a tentative design plan. (6)

OR

II. (a) What is the chief reason for the use of alloy steels in machine parts? (4)

(b) What is the difference between "normalization and unification" (6)

(c) What is meant by "Hole basic system" and "shaft basic system"? Which is better? Why? (6)

(d) What is the significance of preferred number? (4)

III. (a) What is reliability factor? Discuss it in detail. (10)

(b) Write about the various theories of failure. (10)

OR

IV. (a) What is the difference between endurance limit and fatigue strength of a material. Explain. (6)

(b) What is the criteria of failure for
(i) ductile materials subjected to static load
(ii) brittle materials subjected to static load
(iii) ductile materials subjected to varying load (9)

(c) Differentiate between form stress factor and stress concentration factor. (5)

V. It is required to design a coupling of flange type – protected type, for connecting the motor and centrifugal pump shafts. The details of the duty required from the coupling are

Power to be transmitted - 18 KW
Speed in rev/min - 1000

Find the diameter of the motor and pump shaft. The allowable stress in the shaft is limited to 50N/mm^2 and the angle of twist is not to exceed 0.75 degrees in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30N/mm^2. Assume the torsional moment to be transmitted is 20% more than the mean torsional moment. (20)

OR

VI. Assuming the efficiency of the joint as 75%, design a double rivelted butt joint with two cover plater for the longitudinal seam of a boiler shell, 0.75m diameter, to carry a maximum steam pressure of 1.05N/mm^2. The allowable stresses are

f_{tj} tensile stress = 35 N/mm^2
fs, shear stress = 28 N/mm^2 (20)

VII. A steel shaft 50mm diameter is 1.8m between supports. A vertical load of 2250N is applied 0.45m from the bearing and a load of 1800N at 30^0 with the vertical and perpendicular to the shaft is applied at a distance of 0.75m from the same bearing. What is the maximum tensile stress in the shaft? (20)

OR

VIII. Find out the diameter of cast iron pulleys and the thickness and width of a leather belt to transmit 128.7 KW power from a shaft that is directly connected to a steam engine running at 31.4 rad/s to a centrifugal pump with a speed ratio of 1:3.5. (20)

IX. A rawhide pinion is to transmit 30KW at 1150 rev/min. Select a standard module for 20^0 full depth involute teeth, assuming medium shock condition and the power source as multicylinder engine. (20)

OR

X. Two cast iron bend gears have pitch diameter of 75mm and 100mm respectively and are to transmit 2.25 KW at 1100 rev/min of the pinion. The tooth profiles are 14 ½"system.
(i) Determine the face width and the required module from the stand point of strength using Lewis equation.
(ii) Check the design for dynamic load and wear. (20)

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