

B. Tech Degree VI Semester Examination in Marine Engineering, November 2008

MRE 606 MACHINE DESIGN AND DRAWING

Time : 3 Hours

Maximum Marks : 100

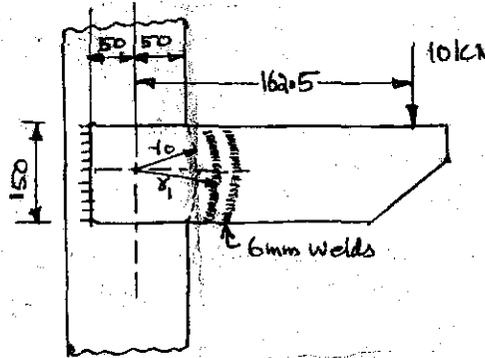
- I. (a) Discuss the following :
- (i) Developed design
 - (ii) Functional design
 - (iii) Initial and final design. (10)
- (b) Briefly discuss :
- (i) Design for realization
 - (ii) Design for profits
 - (iii) Process design
 - (iv) Industrial design. (10)
- OR**
- II. (a) What is the purpose of standardization? (4)
- (b) Define interchangeability and discuss its importance. (6)
- (c) What is the significance of preferred number? (4)
- (d) Enumerate the factors and properties of materials a designer is required to consider while designing a machine part. (6)
- III. (a) What is meant by
- (i) Dynamic loads
 - (ii) Static loads or dead loads
 - (iii) Live loads
 - (iv) Impact loads
 - (v) Inertia loads (5 x 2 = 10)
- (b) What assumptions are made
- (i) in the definition of stress
 - (ii) for finding out impact stress (2 x 3 = 6)
- (c) What type of stress is produced because of centrifugal force, explain. (4)
- OR**
- IV. (a) 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. (3 x 2 = 6)
- (b) What is the difference between endurance limit and fatigue strength of a material? (5)
- (c) Define and discuss
- (i) Factor of safety
 - (ii) Size factor
 - (iii) Stress concentration (3 x 3 = 9)
- V. (a) In a steam engine the maximum steam pressure is 1.0 N/mm^2 absolute and the back pressure is 0.014 N/mm^2 absolute. The cylinder diameter is 0.3 m. Determine the diameter of the screwed end of the piston rod when the allowable stress of mild steel is 45 N/mm^2 in tension. (10)

(Turn Over)

- (b) A 100 mm shaft rotating at 100 rev/min transmits 224 kw. Power is taken off through a gear whose hub is 200 mm long. The key is made of steel having an ultimate shearing stress of 350 N/mm^2 . Using a factor of safety of 5, determine the key desired. (10)

OR

- VI. Determine the maximum stress in the reinforced weld of the bracket plate shown in figure. Assume that the load varies from zero to the maximum value. (20)



- VII. A hollow shaft 0.5 m outside diameter and 0.3 m inside diameter is supported by two bearings 6 m apart. The shaft is driven by a flexible coupling at one end and drives a ships propeller at 10.5 rad/s. The maximum thrust on the propeller is 540 kN when the shaft is transmitting 5885 KW. The shaft weight is 67.5 kN. Determine the maximum shear stress in the shaft considering the weight of the shaft and the column effect. Assume the shock and fatigue factors, K_s and K_b are 1.0 and 1.5 respectively. (20)

OR

- VIII. A 7.5 KW motor running at 1750 rev/min is to be used to drive a rotary pump. The pump should run at approximately 1175 rev/min. The centre distance should not exceed 1100 mm. Space limits the diameter of the driven shear to 290 mm. Determine the shear diameters, the belt size and the number of belts. (20)

- IX. Design the teeth for a pair of cut-teeth spur gears with 20° full depth teeth to be made of nickeld chromium steel. The gears are to transmit 45 kw at 3000 rpm of the pinion. The pinion has 21 teeth and the gear 25 teeth. Find the modules, face, and diameters for continuous service. Will it be necessary to surface harden the teeth? (20)

OR

- X. A pair of straight bevel gears must transmit 15 kw at 1250 rpm of the 18 teeth pinion. Speed reduction ratio is 3.5:1, use $14\frac{1}{2}$ full depth teeth. Select the materials to obtain a compact design. Determine the module, the gear face, the pitch diameters and pitch cone angle for both gears. (20)
