

24258

B. Tech. 5th Semester (Mechanical Engg.)

Examination, December-2012

MECHANICAL MACHINE DESIGN – I

Paper– ME-303-F

Time allowed : 4 hours]

[Maximum marks : 100

Note : (i) *Question No. 1 is compulsory.*

(ii) *Attempt five questions in total with at least one question from each section.*

(iii) *All questions carry equal marks.*

(iv) *Design data book is permitted.*

1. (i) What is the belt slip and creep ? 2½×8
- (ii) Describe the function of Key.
- (iii) Discuss the material of the rivets used in boiler.
- (iv) Write the application of chain drives.
- (v) Name a few automatic clutches.
- (vi) In which cases the use of threaded joints is not recommended ?
- (vii) Define cotter. Why the taper is provided in a cotter ?
- (viii) What do you mean by stiffness design ?

Section-A

2. (a) Define "Interchangeability" and discuss its importance. 10
- (b) What do you understand by stress concentration? Define and differentiate between stress factor and stress concentration factor. 10
3. (a) Define and discuss optimum design. 5
- (b) What do you mean by the term indentation hardness fatigue, machinability and damping capacity? 5
- (c) What are various types of fits? Explain them with the help of neat diagrams. 10

Section-B

4. Design a double riveted butt joint with two cover plates for the longitudinal steam of a boiler shell, 0.75 m diameter to carry a maximum steam pressure of 1.05 N/mm². The allowable stress are :

$f_t = 35 \text{ N/mm}^2$, $f_s = 28 \text{ N/mm}^2$. Assume the efficiency of the joint 75%. 20

5. A $150 \times 100 \times 12.5$ mm angle is welded to a steel plate by two fillet welds along the edge of the 150 mm leg. The angle is subjected to a tension load of 300 KN. Determine the lengths of the welds required if the load is applied with heavy stock. 20

Section-C

6. A marine type flange coupling is required to transmit 2900 KW power at a speed of 100 rev/min. Flanges are connected by 8 taper bolts having an allowable shear stress of 60 N/mm^2 . The material of shaft and bolts used is same. Design the flange coupling and determine the shaft diameter. 20
7. Determine the size of a wire rope necessary for a mine hoist carrying a load of 69.50 KN to be lifted from a depth of 225 metres. A rope speed of 7.9 m/s is to be attained in 10 seconds. 20

Section-D

8. A cone clutch faced with leather is to transmit 15KW at 1000 rev/min. The cone angle is 25° , the mean radius is

0.165m, the coefficient of friction is 0.20 and the friction surface is 75 mm wide.

Determine :

- (i) the axial force required in the spring
- (ii) the normal pressure at the friction surface. 20

9. A differential brake has an operating lever 0.225m long. The ends of the brake band are attached so that their operating arms are 38 mm and 127 mm long. The brake drum diameter is 0.60 m, the arc of contact 300° , brake band is 3.2 mm $\times$ 100 mm and the co-efficient of friction is 0.22. 20

- (a) Find the least force required at the end of the operating lever to subject this band to a stress of 55 MPa.
- (b) What is the torsional moment applied to the brake-drum shaft ?
- (c) Is this brake self locking ? Prove your answer.

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