



C16-M-404

5687

BOARD DIPLOMA EXAMINATION, (C-16)  
MARCH/APRIL—2018  
DME—FOURTH SEMESTER EXAMINATION  
DESIGN OF MACHINE ELEMENTS—I

Time : 3 hours ]

[ Total Marks : 80

PART—A

3×10=30

- Instructions :** (1) Answer **all** questions.  
(2) Each question carries **three** marks.  
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.  
(4) Assume suitable data wherever necessary.

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1. Define the following terms :  
(a) Resilience  
(b) Hardness
2. Define the terms 'principal planes' and 'principal stresses'.
3. List out any three names of inversions of four-bar chain.
4. Calculate the safe tensile load for an M24 bolt when the permissible tensile stress is  $85 \text{ N/mm}^2$ .
5. How is a screw thread designated? Give an example.
6. Define the efficiency of riveted joint.

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7. What shear stress is induced in square key of 12 mm side and 75 mm long, placed in a 50 mm diameter shaft, if 15 kW power is transmitted at 200 r.p.m.?
8. Classify couplings and give example for each type.
9. State the advantages of rolling contact bearings over sliding contact bearings.
10. What is lubricant? Write the types of lubricants.

**PART—B**

10×5=50

**Instructions** : (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A steel shaft of diameter 85 mm is subjected to a bending moment of 1130 N-m and a twisting moment of 6782 N-m. Find the (a) maximum normal stress and (b) maximum shear stress.
12. (a) What are the factors to be considered while designing a product or element?  
(b) Explain Whitworth quick return mechanism with a neat sketch.
13. A screw jack carries a load of 5000 N. It has a square threaded single start screw of pitch 20 mm and 50 mm mean diameter. Calculate the torque to raise the load and efficiency of the screw. What is the torque to lower the load? Take  $\mu = 0.25$ .
14. Two plates each of 10 mm thick are to be joined by double-riveted lap joint. Find the diameter of rivets, pitch of the rivet and efficiency of the joint. Assume the following permissible stresses,  $\sigma_t = 100 \text{ N/mm}^2$ ,  $\sigma_s = 80 \text{ N/mm}^2$  and  $\sigma_c = 160 \text{ N/mm}^2$ .

15. (a) <sup>\*</sup> Draw and mention the proportionate dimensions of hexagonal nut and square nut of dia 20 mm.
- (b) Write the advantages and disadvantages of welded joints over riveted joints.
16. A solid circular shaft is used to transmit a torque of 9·6 N-m. The angle of twist over a length of 2 m is 2°. Estimate the required diameter of the shaft and shear stress induced in the material. Take  $G = 0.8 \times 10^5 \text{ N/mm}^2$ .
17. A shaft transmitting 40 kW of power at 160 r.p.m. is to be connected with another by a sleeve coupling. The permissible shear and crushing stresses for the shaft and key material are  $30 \text{ N/mm}^2$  and  $70 \text{ N/mm}^2$  respectively. Sleeve is made of cast iron whose permissible shear stress is  $15 \text{ N/mm}^2$ . Design the coupling.
18. A flat footstep bearing 300 mm diameter supports a load of 25 kN. If the coefficient of friction is 0·05 and the speed 150 r.p.m., calculate the power lost at the bearing under the following conditions :
- (a) Uniform pressure
- (b) Uniform wear

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