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C14-M-402

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BOARD DIPLOMA EXAMINATION, (C-14)

JUNE—2019

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.

1. Define the terms of principal planes and principal stresses. 1½+1½=3
2. Define the terms of castability, weldability. 1½+1½=3
3. Define the terms of pitch, lead of screw thread. 1½+1½=3
4. Determine the safe tensile load for a bolt of M20. If the safe tensile stress is 80 N/mm². 3
5. What are the ways in which riveted joint may fail? 3
6. What are the types of shafts? 3
7. What is the effect of key way cut into the shaft? 3
8. Define coupling and write its functions. 3

- * 9. What are the types of lubricants and give an example of each type? 3
10. Define rating life of roller bearing. 3

PART—B

5×10=50

Instructions : (1) Answer *any five* questions.
 (2) Each question carries **ten** marks.
 (3) Answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. Derive the expressions for normal and shear stresses on an inclined plane for a member subjected to bi-axial stress. 10
12. A screw jack carries a load of 5 kN. 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 $\mu = 0.25$. 10
13. (a) A steel rod supports a load of 15 kN. If the ultimate tensile strength of the rod is 580 N/mm^2 and factor of safety of 4 is used, find the dimensions of the rod when its section is rectangular with the breadth equal to three times the thickness. 5
- (b) Two machine parts are fastened together tightly by means of a 20 mm tap bolt. If the load tending to separate these parts is neglected, find the stress set-up in this bolt by the initial tightening. 5
14. A single riveted single cover butt joint is used to connect two plates 12 mm thick. The rivets 20 mm in diameter and are provided at a pitch of 90 mm. The permissible stresses in tension, shear and bearing are 125 N/mm^2 , 70 N/mm^2 and 140 N/mm^2 respectively. Find the safe load per pitch length of the joint. 10
15. Two plates of 100 mm width are connected by fillet weld of 8 mm size. If the maximum permissible stress in weld material is 102 N/mm^2 , find the strength of joint. 10

- * 16. A solid circular shaft is subjected to a bending moment of 3000 Nm and torque of 10000 Nm. The shaft is made of mild steel having ultimate tensile stress of 700 MPa and ultimate shear stress of 500 MPa. Assuming a factor of safety is 6, determine the diameter of the shaft by using Guest's theory and Rankine's theory. 10
17. Design a rectangular sunk key for a shaft of 60 mm diameter. The permissible shear stress is 35 N/mm² and crushing stress is 75 N/mm². 10
18. A flat collar bearing has internal and external diameter of 60 mm and 100 mm respectively and the coefficient of friction is 0.05. Assuming the pressure is uniform at 0.14 N/mm², calculate the power lost in friction at a speed of 5 rev/sec. 10
