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C20-M–402

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2024

DME – FOURTH SEMESTER EXAMINATION

DESIGN OF MACHINE MEMBERS

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. Write the sequence of steps in designing a machine element. 3

2. Write the statement and equation for maximum principal stress theory. 3

3. State three advantages of screwed fasteners. 3

4. How a screw thread is designated? Give example. 1+2

5. Define *(a)* caulking and *(b)* fullering with neat sketches. 3

6. State three advantages of welded joints over riveted joints. 3

7. What are the stresses induced in shafts? 3

8. List the requirements of a good coupling. 3

9. Write the difference between radial bearing and thrust bearing. 3

10. Write the function of a spring and classify the springs. 1+2

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

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

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

11. *(a)* A steam engine cylinder of 300 mm effective diameter is subjected to a steam pressure of 1·6 N/mm^2. The cylinder cover is connected by means of 6 bolts. The bolts are tightened with initial load of 1·5 times that of steam load. The copper gasket of stiffness factor 0·5 is used to make the joint leak proof. Find the size of the bolts, so that the stress induced in the bolt does not exceed 100 N/mm^2.

(OR)

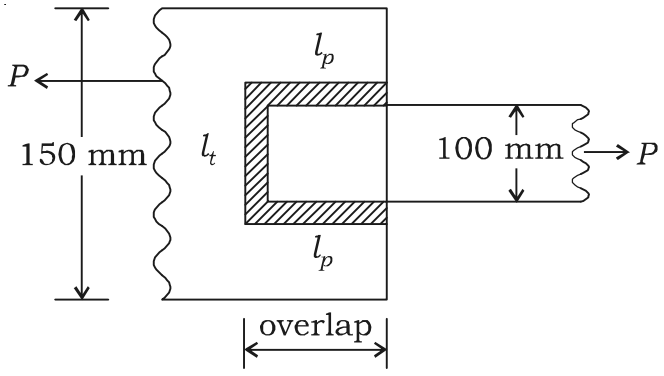
(b) Design and draw an eye bolt made up of steel using following parameters :

Lifting load = 100 kN, Ultimate strength of steel = 550 MPa, Factor of safety = 5.

12. *(a)* Design a double riveted lap joint for joining two plates of 15 mm thick. The allowable stresses are 80 N/mm^2 in tension, 60 N/mm^2 in shearing and 110 N/mm^2 in crushing. Determine the efficiency of the joint.

(OR)

(b) A M.S. flat 100 mm × 10 mm is to be codded to another plate 150 mm × 10 mm by a fillet weld of size 8 mm as shown in the figure. Determine the necessary overlap of the plate. The permissible stress in the plate material is 140 MPa.



13. *(a)* A mild steel shaft transmits 30 kW power at 250 RPM and is subjected to a bending moment of 600 N-m. The allowable shear stress and tensile stresses are 45 N/mm^2 and 65 N/mm^2 respectively. Determine the size of the shaft.

(OR)

(b) Design a muff coupling which is used to connect two steel shafts transmitting 50 kW at 300 rpm. Design shaft and muff from strength point of view and other dimensions by empirical formula. Shear stress for muff and shaft are 15 N/mm^2 and 50 N/mm^2 respectively. Assume maximum torque is 25% more than mean torque.

14. *(a)* A journal bearing rotating at 150 r.p.m. is subjected to a load of 30 kN. The diameter of the journal is 120 mm and (l/d) ratio is 2·8. Find *(a)* bearing pressure, *(b)* frictional torque, *(c)* power lost in friction, *(d)* heat generated and *(e)* heat dissipated. Take coefficient of friction, $\mu = 0{\cdot}016$.

(OR)

(b) Write the advantages and disadvantages of rolling contact bearings over sliding contact bearings.

15. *(a)* A close coiled helical spring of 150 mm mean diameter is made of 12 mm diameter rod and has 20 turns. The spring carries an axial load of 200N. Determine *(i)* shear stress, *(ii)* deflection and *(iii)* stiffness of spring, when carrying this load. Assume $G = 0{\cdot}8 \times 10^5$ N/mm^2.

(OR)

(b) A laminated spring 75 cm long is required to carry a central point load of 8 kW. The central deflection is not to exceed 20 mm and bending stress is 200 N/mm^2; Determine the thickness, width and number of plates if width of the plate is equal to 12 times its thickness.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

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

16. Design and draw a cast iron flange coupling to connect two shafts in order to transmit 80 kW at 700 r.p.m. The permissible stresses may be assumed as permissible shear stress for shaft, bolt and key material is 55 N/mm^2; permissible crushing stress for bolt and key material is 100 N/mm^2; permissible shear stress for CI is 15 N/mm^2. The design includes design of shaft, hub and flange.

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