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BOARD DIPLOMA EXAMINATION, (C–14)
MARCH/APRIL—2017
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 principle stress.

2. List six important mechanical properties of metals.

3. Write any six forms of screw threads.

4. What is meant by bolt of uniform strength?

5. What are the types of welded joints?

6. Differentiate axle and spindle.

7. Sketch a gib headed key for a shaft of dia 50 mm and show its proportionate dimensions.

8. Differentiate rigid and flexible couplings.

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9. Specify the types of sliding contact bearings.

10. What is meant by journal bearing?

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 rectangular block of material is subjected to a tensile stress of 80 N/mm^2 on one plane and a tensile of 35 N/mm^2 on a plane at right angles together with shear stresses of 50 N/mm^2 on the same planes. Find normal stress and shear stresses on a 15° plane and its resultant stress on the same 15° plane. 10

12. A steam engine cylinder has an effective diameter of 350 mm and the maximum steam pressure acting on the cylinder is 1·25 N/mm^2. Calculate the number and size of bolts required to fix the cylinder cover, assuming the permissible stress in the bolts as 33 MPa. 10

13. A double-riveted double-cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are :

     Allowable tensile stress = 120 MPa;

     Allowable shear stress = 100 MPa;

     Allowable crushing stress = 150 MPa.

Find the efficiency of joint, taking the strength of the rivet in double shear as twice that of single shear. 10

14. A plate 75 mm wide and 12·5 mm thick is joined with another plate by a single traverse weld and double parallel fillet weld as shown in figure below. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loads.   10
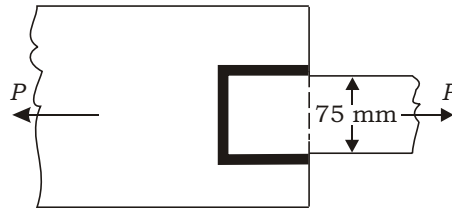
15. A steel spindle transmits 6 kW at 500 r.p.m. The angular deflection should not exceed 0·25° per meter length of spindle. If the modulus of rigidity for the material of spindle is 84×10^3 N/mm^2, find the diameter of the spindle and shear stress induced in the spindle.   10

16. Design a cast iron flange coupling to connect two shafts in order to transmit 9 kW at 800 r.p.m. The following permissible stresses may be assumed :

Permissible shear stress for shaft, bolt and key material is 35 N/mm^2. Permissible crushing stress for bolt and key material is 65 N/mm^2, permissible shear stress for CI is 20 N/mm^2.   10

17. Mention the properties of lubricants and explain any four.   10

18. *(a)* Draw the design flowchart for the design of a machine element.   5

    (b) Draw an eye bolt of 30 mm nominal dia with proportionate dimensions.   5

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