# 4478

## BOARD DIPLOMA EXAMINATION, (C-14)

## OCT / NOV-2017

## DME-FOURTH SEMESTER EXAMINATION

### DESIGN OF MACHINE ELEMENTS - I

Time : 3 Hours ]          [Total Marks : 80

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### PART - A        3 X 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 Durability and Reliability
2. State maximum Shear stress theory. Give mathematical expression for it.
3. List any six forms of screw threads.
4. List various types of threads used in power screws. How a square thread is designated?
5. What are the ways in which riveted joint may fail?
6. A hollow steel shaft has 200 mm external diameter and 100 mm internal diameter. Shear stress at outer surface in 64 N/ mm$^2$. Calculate the Shear stress at inner surface.
7. Sketch Woodruff key with proportions.
8. What are the requirements of good coupling?
9. Define bearing. What is the difference between radial bearing and thrust bearing?
10. State the advantages of rolling contact bearings over sliding contact bearings.

### PART - B        10 X 5= 50

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

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

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

11. At a point in a strained body, the stresses acting are as follows: $\sigma_x$ = 160 MPa (Tensile); $_y$ = 70 MPa (Compressive); $_{xy}$ = 25 MPa. Determine.
(a) Normal Strees (b) Tangential stress on a plane inclined at $60^0$ to a vertical axis (c) Principal stresses (d) Direction of principal stresses (e) Maximum Shear stress and its direction.

12. An eye bolt is to be used for lifting a load of 95 kN. Design the bolt if the tensile stress is not to exceed 100 N/mm². Draw a neat proportionate sketch of the bolt.

13. a) Explain the following theories of failure.
    (i) Maximum Principle stress theory
    (ii) Maximum principle strain theory
    b) A single started square threaded screw of 100 mm mean diameter and 18 mm pitch supports a load of 25 kN. The coefficient of friction is 0.18. Find
    (i) The force required (ii) Torque required to lower the load.

14. Design a double riveted double cover butt joint for two plates of 16 mm thick. Take $_t$ = 100 MPa; $_C$ = 150 MPa; = 90 MPa.

15. Two steel plates 100 mm wide and 12.5 mm thick are to be joined by double lap weld joint. Find the length of the weld if the maximum tensile stress is not to exceed 75 N/ mm² and maximum tensile load carried by the plates is 100 kN.

16. A solid shaft is transmitting 45 kW at 200 rpm. Determine the diameter of the shaft if the maximum allowable Shear stress is 360 MPa and factor of safety is 8.Also compute the outside and inside diameters of the hollow shaft if it is used for the same purpose. What will be percentage of material saving if the solid shaft is replaced by hollow shaft? Take diameters ratio, K= 0.5.

17. Design and draw a cast iron muff coupling using the following data.
    i) Mild steel shaft transmit 100 kW at 200 rpm
    ii) Allowable Shear and crushing stresses for the shafts and key material are 40 N/mm² and 100N/mm² respectively.
    iii) The permissible shear stress in the muff in 15 N/mm². Assume maximum torque transmitted is 25% greater than the mean torque.

18. A journal bearing of diameter 50 mm and length 100 mm is subjected to a bearing load of 7 kN. The speed of journal is 100 rpm and coefficient of friction is 0.004. The temperature of lubricating oil is $75^0$C and room te mperature is $35^0$C.Find the amount of artificial cooling required. Assume coefficient of heat dissipated as 0.00167 kJ/ min/ cm² /$^0$C.

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