# 5687

## BOARD DIPLOMA EXAMINATION, (C-16)
## OCTOBER/NOVEMBER-2018
## DME - FOURTH SEMESTER EXAMINATION

### DESIGN OF MACHINE ELEMENTS – I

*Time :* 3 Hours ]                                                [ Total Marks: 80

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## PART-A

3X10=30

***Instructions    :***    1. Answer **All** questions.

2. Each question carries **Three** marks.

3. Answer should be brief and straight to the point and shall not exceed

five simple sentences. Use of steam tables is permitted

1. How do you classify loads?

2. Define the terms Hardness and Resilience.

3. Define a kinematic pair.  Give at least three examples.

4. What size of an axial hole must be drilled in M 24 bolt to make it uniform strength?

5. Write the expression for efficiency of a power screw.

6. What are the ways in which riveted joint may fail?

7. Classify couplings and give example for each type.

8. A hallow steel shaft has 200 mm external diameter and 125mm internal diameter shear stress at outer surface is 64 N/mm$^2$.  Calculate the shear stress at inner surface.

9. Define bearing.  What is the difference between radial bearing and thrust bearing?

10. Define rating life of roller bearing.

## PART-B

*Instructions* :     1. Answer any **Five** questions.
                     2. Each question carries **ten** marks.

11. At a certain point in a body the normal stresses are 85 N/mm$^2$ (tensile) and 28 N/mm$^2$ (compressive) exist in two perpendicular planes.  A shearing of 42 N/mm$^2$ acts at this point.  Determine the principle stress and the maximum shear stress at this point.

12. (a) What are the factors to be considered for the design of machine elements?

    (b) Explain Whitworth Quick Return Mechanism with a neat sketch.

13. In a testing machine a square threaded screw has to withstand a tensile load of 600 kN. The nominal diameter of the screw is 100 mm and the pitch is 20mm.  Find the height of the nut, if the average shear stress in the screw thread is 25 N/mm$^2$

14. (a) Write the formulae for various stresses induced in screw fasteners due to initial tightening.

    (b) What are the advantages and disadvantages of welded joints over the riveted joints?

15. Two plates of 10mm thick are connected by a double riveted, double cover butt joint with 20mm diameter rivets.  Find the pitch and efficiency of the joint.  The permissible stresses are $\sigma_t = 90$ N/mm$^2$, $\tau = 75$N/mm$^2$ and $\sigma_c = 150$ N/m$^2$

16. A solid shaft is subjected to a bending moment of 3460 kN-mm and a torque of 1150 kN-mm. Determine the diameter of the shaft given the factor of safety as 6 assuming ultimate bending stress as 690 N/mm$^2$ and ultimate shear stress as 516 N/mm$^2$.

17. Design and draw a cast iron muff coupling using the following data:

    a)  Mild steel shaft transmit 80kW at 150 rpm.

    b)  Allowable shear and crushing stresses for the shafts and key material are 40 N/mm$^2$ and 100 N/mm$^2$ respectively.

    c)  The permissible shear stress in the muff is 15 N/mm$^2$.  Assume maximum torque transmitted is 25% greater than the mean torque.

18. The thrust of a propeller shaft in a marine is absorbed by 4 collars.  The rubbing surfaces of these collars have outer diameter 300mm and inner diameter of 200mm. If the shaft runs at 100 rpm, the bearing pressure being 0.5 N/mm$^2$, and coefficient of friction 0.03, determine power absorbed by collar.  Assume uniform pressure

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