



C16-M-405

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BOARD DIPLOMA EXAMINATION, (C-16)
JANUARY/FEBRUARY—2022
DME - FOURTH SEMESTER EXAMINATION
DESIGN OF MACHINE ELEMENTS

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. List out any six factors to be considered for the design of machine elements.
2. What size of hole must be drilled in M34 bolt to make it uniform strength?
3. A solid shaft is required to transmit a torque of 15 kN/m. Find the necessary diameter of the shaft, if the allowable shear stress is 60 N/mm².
4. Two pulleys 600 mm and 400 mm diameters are connected by a belt. Central distance between them is 6 m. Find the angle of contact for (a) open belt drive and (b) crossed belt drive.
5. A shaft running at 400 rpm carries a pulley of 600 mm diameter, which drives another shaft at 600 rpm by means of a flat belt of 5 mm thick. Determine the diameter of the pulley on driven shaft if the total slip is 5 percent.
6. State any two advantages and two applications of epicyclical gear train.

7. How sliding contact bearings are classified?
8. Write three applications of cams.
9. State the function of Governor.
10. Define the following terms :
 - (a) Height of Governor
 - (b) Equilibrium speed

PART—B

10×5=50

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

11. An eye bolt is used for lifting a load of 60 kN. Design and draw the eye bolt if the tensile stress is not to exceed 100 N/mm².
12. 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 and assuming ultimate bending stress as 690 N/mm² and ultimate shear stress as 516 N/mm².
13. A mild steel shaft has to transmit 75 kW at 210 rpm. The allowable shear stress in the shaft is limited to 42 N/mm² and the angle of twist is not to exceed 1° in a length of 20 times the diameter. Calculate the suitable diameter for the shaft. Assume $G = 79 \text{ GN/m}^2$.
14. A belt drive is designed to transmit 7.5 kW at a belt speed of 12 m/s. The ratio of belt tension is 2.25. Determine the angle of lap and belt tensions if coefficient of friction is 0.3.
15. Explain the following gear trains with neat sketches and state their applications :
 - (a) Reverted gear train
 - (b) Compound gear train

16. A journal bearing having a diameter of 65 mm is subjected to a load of 5 kN at a speed of 200 rpm. If length to diameter ratio is 3 and coefficient of friction is 0.02, find—

(a) Bearing pressure;

(b) Heat generated.

17. Draw the profile of a cam to give the following motion to a reciprocating follower with a flat contact of face :

(a) Out stroke during 120° of cam rotation

(b) Dwell for the next 30° of cam rotation

(c) Return stroke during 120° of cam rotation

(d) Dwell for the remaining 90° of cam rotation

The stroke of the follower is 30 mm and the minimum radius of the cam is 25 mm. The follower moves with uniform velocity during both out stroke and return stroke. The axis of the follower passes through the axis of the cam shaft.

18. Explain the working principle of Watt governor with neat sketch.

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