



C09-M-605

**3783**

**BOARD DIPLOMA EXAMINATION, (C-09)**

**MARCH/APRIL—2017**

**DME—SIXTH 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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. List out any six factors to be considered while designing an element.

2. List out the various types of screw fastenings.

3. Find the safe load for the bolt of M5, assuming a safe tensile stress of  $40 \text{ N/mm}^2$ .

4. A shaft of 75 mm dia transmits power of 75 kW at 140 r.p.m. Find the maximum shear stress induced in the shaft.

5. Give the requirements of a good coupling.

6. What is the expression for the ratio of belt tensions in case of flat belt drive?

7. Write the differences between belt drive and chain drive.

8. Define (a) base circle, (b) dwell, and (c) lift related to CAMS.

9. What is a turning moment diagram?

10. State the functions of Governor.

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**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) List the various types of locking devices.  
(b) A steel rod 3 m long and 15 mm diameter is subjected to an axial tensile load of 45 kN. Find the change in (i) length, (ii) diameter, and (iii) volume. Take  $E = 200 \text{ kN/mm}^2$ , and  $1/m = 0.3$ .
- 12.** An eye bolt has to lift a load of 75 kN. Ultimate strength of steel is  $540 \text{ N/mm}^2$  and factor of safety is 6. Design the eye bolt and draw a proportionate sketch.
- 13.** A mild-steel shaft transmits 15 kW power at 150 r.p.m. and is subjected to a bending moment of 500 N-m. The allowable shear stress and tensile stress are  $40 \text{ N/mm}^2$  and  $52 \text{ N/mm}^2$ . What size of the shaft will be required if it is subjected to gradually applied loads?
- 14.** Design a muff coupling for transmitting 40 kW at a speed of 120 r.p.m. The permissible shear and crushing stress for the shaft and key material are 30 MPa and 80 MPa respectively. The material of the muff is cast iron with permissible shear stress of 15 MPa. Assume that the maximum torque transmitted is 25% greater than mean torque.
- 15.** Explain the following gear trains with neat sketches and mention their applications :
- (a) Compound gear train  
(b) Simple gear train

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- 16.** A leather belt 10 mm thick transmits 40 kW power from a pulley of 1.5 m diameter running at 250 r.p.m. The angle of lap is  $150^\circ$  and the coefficient of friction is 0.3. Find the width of belt required if the permissible stress in the belt material is  $2.5 \text{ N/mm}^2$ .
- 17.** Design a CI spur gear of 500 mm PCD for shaft A to transmit 8 kW at 140 r.p.m. Assume the design stress for MS shaft as  $45 \text{ N/mm}^2$  and module as 10 mm. Design should include—
- (a) number of arms;
  - (b) thickness of rim;
  - (c) gear shaft diameter;
  - (d) hub diameter and length.
- 18.** Draw the displacement diagram and cam profile to give the following motion to a knife-edge follower :
- Outward stroke through 40 mm during  $120^\circ$  of cam rotation, dwell for  $60^\circ$  of cam rotation. Return stroke during the next  $90^\circ$ , dwell for the remaining part of cam rotation. The minimum radius of cam is 35 mm. The line of stroke of the follower is coinciding with the centre of the cam axis and the follower moves with simple harmonic motion.

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