



C09-M-605

**3783**

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

**OCT/NOV—2015**

**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. Define :
  - (a) Factor of safety
  - (b) Working stress
2. Write the possible ways of failure of bolts.
3. Mention the details of the screw thread M18 1 5-9h.
4. Differentiate between shaft, spindle and axle.
5. What is a key? State its function.
6. List out the factors that affect the selection of a drive in power transmission.
7. State : (a) circular pitch and (b) pressure angle related to gear wheels.
8. How do you classify the followers of cams?
9. List three differences between flywheel and governor.
10. Define the following terms related to governors :
  - (a) Effort
  - (b) Power

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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.** The steam engine cylinder of 250 mm effective diameter is subjected to a steam pressure of  $1.2 \text{ N/mm}^2$ . The cylinder cover is connected by means of 6 bolts. The bolts are tightened with initial load of 1.5 times that of steam load. A copper gasket of stiffness factor 0.5 is used to make the joint leakproof. Find the size of the bolts so that the stress induced in the bolts is not to exceed  $100 \text{ N/mm}^2$ .
- 12.** Design and draw a cast iron muff coupling using the following data :
- (a) Mild steel shaft transmits 80 kW at 150 r.p.m.
  - (b) Allowable shear and crushing stresses for the shafts and key material are  $40 \text{ N/mm}^2$  and  $100 \text{ N/mm}^2$  respectively.
  - (c) The permissible shear stress in the muff is  $15 \text{ N/mm}^2$ . Assume maximum torque transmitted is 25% greater than the mean torque.
- 13.** A mild steel shaft transmits 20kW power at 200 r.p.m and is subjected to a bending moment of 560 N-m. The allowable shear stress and tensile or compression stress are  $42 \text{ N/mm}^2$  and  $56 \text{ N/mm}^2$  respectively. What size of the shaft will be required if it is subjected to gradually applied load.
- 14.** (a) What are the various types of belt drives used in power transmission? Sketch a compound belt drive. 4
- (b) An induction motor drives the main shaft by means of a flat belt. The diameter of pulleys of motor shaft and the main shaft are 450 mm and 750 mm respectively. Another pulley of 500 mm diameter mounted on the main shaft drives a 700 mm diameter pulley keyed to the counter shaft. If there is a 3% slip on each drive, determine the speed of the counter shaft. Neglect the thickness of the belt and assume that the motor runs at 1400 r.p.m. 6

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- 15.** Explain the following gear trains with neat sketches and state their applications :  
(a) Epicyclic gear train  
(b) Reverted gear train
- 16.** A set of spur gears has to transmit 32 kW when the pinion rotates at 400 r.p.m. The gear ratio is 1:4. The permissible stress for pinion and driver gear materials is  $120 \text{ N/mm}^2$  and  $100 \text{ N/mm}^2$  respectively. The pinion gear has 20 teeth and its face width is 14 times the module. Compute (a) Module and (b) Face width.
- 17.** 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.
- 18.** (a) List out factors to be considered while designing a machine element.  
(b) An eye bolt to be used for lifting a load of 70 kN. Design and draw the eye bolt, if the tensile stress is not to exceed  $90 \text{ N/mm}^2$

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