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C16-M-405

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BOARD DIPLOMA EXAMINATION, (C-16)
SEPTEMBER/OCTOBER - 2020
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. A thread is designated by M24×3-7d. What does it mean?
3. Write the torsion equation and state the terms involved in it.
4. Write any three advantages of belt drive over other forms of drives.
5. List any six applications of chain drive.
6. Define the following terms :
 - (a) Circular pitch
 - (b) Back lash

- * 7. How are the bearings classified?
8. Draw a neat sketch of cam mechanism.
9. What is the function of flywheel?
10. State any three differences between flywheel and governor.

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. Design and draw an eye bolt using following parameters :

Lifting load = 80 kN, Ultimate strength of steel = 540 MPa,
Factor of safety = 6

12. A mild steel shaft transmits 23 kW at 200 r.p.m. It carried a central load of 900 N and is simply supported between the bearings 2.5 m apart. The allowable tensile stress is 56 MPa and the shear stress is 42 MPa. Determine the size of the shaft.

13. Design a protective cast iron flange coupling to connect two shafts in order to transmit 15 kW at 200 r.p.m. having an permissible shear stress of 40 N/mm^2 . The working stress in the bolts should not exceed 30 N/mm^2 . Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. Permissible shear stress for CI flange is 14 N/mm^2 .

- * 14. Two pulleys 450 mm and 200 mm diameters are on parallel shafts 2 m apart and are connected by a crossed belt. Find the length of belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1000 N, and the coefficient of friction between belt and pulley is 0.25?

- * 15. Explain the following gear trains with neat sketches and state their applications :
- (a) Simple gear train
 - (b) Compound gear train
 - (c) Reverted gear train
16. A turbine shaft of diameter 250 mm is running at 1600 r.p.m. in a journal bearing and supports a load of 130 kN. Calculate (a) length of bearing if the permissible bearing pressure is 1.5 N/mm^2 , (b) coefficient of friction, (c) rubbing velocity, (d) amount of heat to be removed by the lubricant per minute. The bearing temperature is 58°C and viscosity of oil at this term is 0.02 kg/m-s . The bearing clearance is 0.25 mm , $k = 0.002$.
17. Draw the displacement diagram and cam profile for a knife edge follower moving with uniform velocity as given below :
- Outward stroke 120° of cam rotation, Dwell 30° ; Return stroke 90° of cam rotation, Dwell for the remaining period of cam rotation. Stroke of the follower is 30 mm . The axis of the follower passes through the axis of the cam shaft. The minimum radius of the cam is 25 mm . The cam is rotating in clockwise direction.
18. (a) Explain the porter governor with neat sketch.
(b) The kinetic energy of flywheel at 150 r.p.m. is 1200 joules . If the radius of gyration is 0.5 m , what should be its mass?

5+5=10
