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C16-M-405**6450**

BOARD DIPLOMA EXAMINATION, (C-16)
OCTOBER/NOVEMBER—2023
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. Define the terms hardness and resilience.
2. How is a screw thread designated? Give an example.
3. What are the requirements of a good coupling?
4. Define slip and creep of a belt.
5. Write any three differences between belt and chain drive.
6. Define the terms (a) diametral pitch and (b) module.
7. Define bearing and classify bearings according to load applications.
8. How do you classify the followers of cams?
9. Draw a simple turning moment diagram for a four-stroke engine.
10. State any three differences between fly wheel and 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 criterion for valuation is the content but not the length of the answer.

- 11.** A cylinder cover of a steam engine is secured by 12 studs, the cylinder has 305 mm diameter and has a steam pressure of 1.2 N/mm^2 gauge. Calculate the diameter of the studs, assuming the permissible stress intensity to be 30 N/mm^2 .
- 12.** Design a CI flange coupling to connect two shafts in order to transmit 7.5 kW at 720 rpm. The following permissible stresses may be assumed. Permissible shear stress for shaft, bolt and key material = 33 N/mm^2 . Permissible crushing stress for bolt and key material = 60 N/mm^2 , permissible shear stress for CI = 15 N/mm^2 .
- 13.** A solid circular shaft is used to transmit a torque of 9.6 N-m. The angle of twist over a length of 2 m is 2° . Estimate the required diameter of the shaft and shear stress induced in the material. Take $G = 0.8 \times 10^5 \text{ N/mm}^2$.
- 14.** A leather belt, 120 mm wide and 6 mm thick transmits power from a pulley 750 mm in diameter running at 500 rpm taking angle of lap = 150° , coefficient of friction = 0.3, mass of the belt as 0.75 kg/m length, the permissible stress as 2.75 MN/m^2 . Compute the maximum power that can be transmitted.
- 15.** A set of spur gears has to transmit 40 kW, when the pinion rotates at 400 rpm. The gear ratio is 1 : 4. The permissible stress for pinion and driver gear material are 120 N/mm^2 and 100 N/mm^2 respectively. Determine the (a) module and (b) face width if the pinion has 20 teeth and face width is 15 times the module.
- 16.** A foot step bearing supports a shaft of 150 mm diameter which is counter-bored at the end with a hole diameter of 50 mm. If the bearing pressure is limited to 0.8 N/mm^2 and the speed is 100 rpm, find
(a) the load to be supported.
(b) the power lost in friction.
(c) the heat generated. Assume coefficient of friction = 0.015

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17. Draw the cam profile to give the following motions to a roller follower :

(a) Outward stroke during 60° of cam rotation.

(b) Dwell for 15° of cam rotation

(c) Return stroke during 60° of cam rotation.

(d) Dwell for the remaining part of cam rotation.

The stroke of the follower is 25 mm; the diameter of the roller is 20 mm; the minimum radius of cam is 40 mm. The line of stroke of the follower passes through the centre of the cam axis and the outward and return strokes take place with uniform acceleration and retardation.

18. Explain the porter governor with a neat sketch.

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