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BOARD DIPLOMA EXAMINATION, (C-16)

MAY/JUNE—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 (a) working stress and (b) factor of safety.
2. Define the terms (a) major diameter, (b) pitch and (c) lead related to screw thread nomenclature.
3. Write the characteristics of a good shaft material.
4. Write the advantages of V-belt over flat belt.
5. What are the important factors considered while selecting a suitable power drive?
- * 6. Define the terms (a) circular pitch, (b) module and (c) pressure angle related to gear tooth.
7. What are the characteristics of a good bearing material?
8. Draw a neat sketch of cam mechanism.
9. Find the time period of a simple pendulum whose length is 127 cm.
10. Define the terms (a) height of a governor and (b) equilibrium speed of a 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.** The cylinder head of a steam engine is subjected to a steam pressure of 1.5 N/mm^2 . It is held in position by means of 8 bolts. A soft copper gasket is used whose $K = 0.5$ to make the joint leak proof. The effective diameter of the cylinder is 350 mm. Find the size of the bolts so that the stress in the bolts is not to exceed 100 N/mm^2 .
- 12.** A steel spindle transmits 10 kW at 600 r.p.m. The angular deflection should not exceed 1° per meter length of spindle. If the modulus of rigidity for the material of spindle, is $80 \times 10^3 \text{ N/mm}^2$, find the diameter of the spindle and shear stress induced in the spindle.
- 13.** Design and draw a muff coupling to connect two shafts transmitting 90 kW power at 300 r.p.m. The permissible shearing and crushing stresses for shaft and key material are 55 N/mm^2 and 100 N/mm^2 respectively. The material for muff is cast iron with a permissible shear stress of 15 N/mm^2 . Assume that the maximum torque transmitted is 20% more than the mean torque.
- 14.** A leather belt 120 mm wide and 6 mm thick transmits power from a pulley of 750 mm diameter running at 550 r.p.m. making an angle of lap is 165° . The coefficient of friction is 0.3. The mass of the belt is 0.85 kg/m length, the permissible stress of belt material is 2.65 MN/m^2 . Compute the maximum power that can be transmitted.
- 15.** Draw and explain the back gear arrangement of a lathe.
- 16.** A journal bearing rotating at 150 r.p.m. is subjected to a load of 30 kN. The diameter of the journal is 120 mm and (l/d) ratio is 2.5. Find (a) bearing pressure, (b) frictional torque, (c) power lost in friction, (d) heat generated and (e) heat dissipated. Take coefficient of friction, $\mu = 0.025$.

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- 17.** Draw the cam profile for the roller follower of roller diameter 20 mm, the outward and return strokes take place with simple harmonic motion. Out stroke 110° , dwell 30° , return stroke 120° and dwell for the remaining cam rotation. Stroke of the follower is 50 mm and minimum radius of the cam is 30 mm, axis of the follower passes through axis of the camshaft.
- 18.** Explain with a neat sketch working of a Porter governor.

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