



C20-M-503

7657

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER / NOVEMBER—2024

DME - FIFTH SEMESTER EXAMINATION

THEORY OF MACHINES

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 slip and creep of a belt.
2. Two pulleys 350 mm and 700 mm diameters which are fixed to two parallel shafts 5 m apart are connected by an open belt. Find the length of belt. 3
3. A gear having 80 teeth meshes with a pinion having 30 teeth. Calculate the centre distance between gear and pinion, if the circular pitch is 12 mm. 3
4. Define the terms (a) back lash and (b) gear ratio related to gear drives. 3
5. What is the function of a flywheel? State its applications. 1+2
6. Define the terms effort and power of a governor. 3
7. Write three applications of cams. 3
8. Write the classification of followers used in cams. 3
9. Find the time period of a simple pendulum whose length is 127 cm. 3
10. Define the terms (a) amplitude, (b) periodic time and (c) frequency related to vibrations. 3

PART—B

8×5=40

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **eight** marks.
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

- 11.** (a) A belt is required to transmit 15 kW from a pulley of 1000 mm diameter at 450 r.p.m. The angle of lap is 160° and coefficient of friction is 0.3. If the safe working stress of belt material is 1.5 N/mm^2 , find the width of belt thickness of belt is 10 mm. 8

(OR)

- (b) (i) Describe the components of roller chain with a line diagram. 4
(ii) Write the advantages and disadvantages of a chain drive. 2+2

- 12.** (a) With the help of a neat sketch, explain the back gear arrangement in lathe machines. 4+4

(OR)

- (b) A three-speed reduction gearbox is to have the following spindle speed ratio as nearly as possible: Bottom (first) gear 5.2 : 1; second gear 3 : 1; third gear 1.6 : 1; output shaft and input shafts are to be in line and the centre distance which is horizontal between them and the lay shaft is 145 mm. All the gears are to be of 5 mm module and the number of teeth on pinion is 20. Determine the suitable number of teeth on all the gear wheels. Sketch the arrangement. 6+2

- 13.** (a) The speed of the crankshaft of an engine varies from minimum of 110 rev/min to a maximum of 120 rev/min. A flywheel of mass 500 kg and radius of gyration 1.3 m is keyed to the crankshaft. If the work done per cycle is 16 kJ, calculate (i) the maximum fluctuation of energy in the flywheel; (ii) the coefficient of fluctuation of speed, if the mean speed is 115 rev/min; (iii) the coefficient of fluctuation of energy. 3+3+2

(OR)

- (b) Describe the working of porter governor with legible sketch. 4+4

14. (a) Draw the cam profile for the knife edge follower, the outward and return strokes takes place with uniform velocity. Out stroke 90° , dwell 30° , return stroke 120° and dwell for the remaining cam rotation. Stroke of the follower is 40 mm and minimum radius of the cam is 30 mm, axis of the follower passes through axis of the camshaft. 8

(OR)

- (b) Draw the displacement diagram and cam profile for a roller follower of roller diameter 20 mm moving with SHM. Out stroke 90° ; Dwell 30° ; Return stroke 120° and dwell for the remaining cam rotation stroke of the follower is 40 mm and minimum radius of cam is 30 mm. The axis of the follower passes through the axis of the cam shaft. 3+5

15. (a) Explain the classification of mechanical vibrations with line diagram. 8

(OR)

- (b) Explain the sources of vibrations in mechanical systems. 8

PART—C

10×1=10

- Instructions :** (1) Answer the following question.
(2) The question carries **ten** marks.
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. A belt transmitting power from a motor to machine having a mass of 2.45 kg per meter length and the maximum permissible tension in it is 1000 N. The angle of contact is spread over $\frac{5}{9}$ of the pulley circumference. Coefficient of friction is 0.28. If the belt runs under maximum power condition; determine the optimum belt speed and maximum power transmitted. 5+3

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