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7657

BOARD DIPLOMA EXAMINATION, (C-20)

MAY/JUNE—2023

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. Two pulleys 800 and 400 mm diameters which are fixed to two parallel shafts 4 m apart are connected by belt drives. Find the length of belt required in crossed belt drive. 3
2. State the advantages and disadvantages of chain drive. $1\frac{1}{2}+1\frac{1}{2}$
3. Define module and circular pitch related to gears. 3
4. Write short note on epicyclic gear train. 3
5. Write three differences between Flywheel and Governor. 3
6. Define effort and power of a Governor. 3
7. Draw a sketch of cam mechanism and label the parts. 3
8. Define the terms related to cam (a) base circle and (b) dwell. 3
9. Classify the mechanical vibrations based on two criteria. 3
10. A mass of 5 kg is attached to a vertical spring and is set to vibratory motion and is measured to make 4 oscillations per second. Calculate the stiffness of spring. 3

PART—B

8×5=40

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- 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 flat belt drive is used to transmit 15 kW power from an electric motor to a flour mill. The following data is available : 8
Thickness of belt : 10 mm; Density of belt material : 1.1 gm/cm^3 .
Motor pulley diameter : 1400 mm; Motor pulley speed : 135 rpm;
Stress in the belt : 2.4 MN/m^2 . Angle of contact : 2.75 radians;
Coefficient of friction : 0.3;
Determine the width of the belt.

(OR)

- (b)** A belt transmitting power from a motor to machine weighs 24 N/meter and the maximum permissible tension in it is 1000 N. The angle of contact is spread over $5/9$ 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. 8

- 12. (a)** Explain the following gear trains with a neat sketches and mention their applications : 4+4
(i) Reverted gear train
(ii) Epicyclic gear train

(OR)

- (b)** In the back gear arrangement of a lathe, size of steps of cone pulley are 100,150,200 and 250 mm. Calculate the range of speeds available in (i) direct and (ii) back gear if the counter shaft runs at 250 RPM. Assume identical cone pulley on motor shaft. 8

Number of teeth on pinions = 120 and 70

Number of teeth on spurs = 200 and 250, '70-200' compound gear may be used

Assume identical cone pulley on motor shaft.

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13. (a) A solid disc of flywheel 0.4 m diameter and 100 mm thick is made from cast iron of density $7 \times 10^3 \text{ kg/m}^3$. Then the coefficient of fluctuation of speed 2.8%. Determine (i) moment of inertia of flywheel, (ii) kinetic energy at 1000 rev/min and (iii) maximum fluctuation of energy. 3+3+2

(OR)

- (b) State the function of Governor. Explain the Watt's Governor with a sketch. 2+3+3

14. (a) A cam is to give the following motion to a roller follower :

- (i) Outstroke during 90° of cam rotation;
- (ii) Dwell for the next 30° of cam rotation;
- (iii) Return stroke during next 120° of cam rotation, and
- (iv) Dwell for the remaining 120° of cam rotation.

The stroke of the follower is 40 mm and the minimum radius of the cam is 30 mm. The diameter of the roller is 20 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the displacement diagram and the profile of the cam when the axis of the follower passes through the axis of the cam shaft. 3+5

(OR)

- (b) A cam is to be designed for a knife edge follower with the following data :

- (i) Cam lift = 50 mm during 120° of cam rotation with simple harmonic motion
- (ii) Dwell for the next 30°
- (iii) During the next 120° of cam rotation, the follower returns to its original position with simple harmonic motion
- (iv) Dwell during the remaining

Draw the displacement diagram and the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft and the radius of the base circle of the cam is 35 mm. 3+5

15. (a) Explain the sources of vibrations in mechanical systems. 8

(OR)

(b) (i) Explain the basic elements of vibrating system with a neat sketch.

(ii) Explain two types of damping. 4+4

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.** Two pulleys 1.2 m and 0.5 m diameter are on parallel shaft 3.6 m apart, and are connected by an open belt drive. The belt has a mass of 0.9 kg/m length, and the maximum tension in it is not to exceed 2000 N. The larger pulley which is the driver runs at 3.5 rev/s and coefficient of friction between belt and pulley is 0.25. Calculate the power transmitted by the belt.

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