C20-M–**503**

7657

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER / NOVEMBER—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. How do you classify the chain drives?   3

2. The diameter of driver pulley which rotates at 130 rpm is 400 mm. If the linear mass density of belt material is 1·3 kg/m. Find the centrifugal tension in the belt.   3

3. State any two advantages and two applications of epicyclic gear train.   3

4. Write the relation between velocity ratio and train value of gear train.   3

5. Define effort and power of a governor.   3

6. What is the turning moment diagram of flywheel?   3

7. List the different types of followers.   3

8. State the function of cam and give its classification.   1+2=3

9. Find the length of simple pendulum, if its time period is 2·5 second and acceleration due to gravity is 9·8 m/s^2.   3

10. Define the following terms :

(a) Amplitude *(b)* Time period *(c)* Degree of Freedom.

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 20 kW from a pulley of 1000 mm diameter at 420 rpm. The angle of lap is 160° and coefficient of friction is 0·35. If the safe working stress of the belt material is 1·2 N/mm^2, find the width of the belt. Thickness of belt is 10 mm. Density of material is 1·1 gm/cm^3.

(OR)

(b) Two parallel shafts whose centre lines are 5 m apart, are connected by an open belt drive. The diameter of larger pulley is 1·6m and that of small pulley is 1·06 m. The initial tension is 3 kN. The mass of the belt is 1·4 kg/m length. The coefficient of friction between the belt and pulley is 0·35. Taking centrifugal tension into the account, calculate the HP transmitted, when the smaller pulley rotates at 400 rpm.

12. *(a)* Design a reverted gear train having four gears to give a speed reduction of 10 All gears are to be same pitch and no gear is to have less than 14 teeth. Sketch the arrangement.   5+3=8

(OR)

(b) Explain the working of back gear assembly of a lathe with a neat sketch.   4+4=8

13. *(a)* The speed of the crankshaft of an engine varies from minimum of 120 rpm to a maximum of 126 rpm. 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 123 rev/min;

(iii) The coefficient of fluctuation of energy.

(OR)

(b) Explain the working of simple Watt governor with a neat sketch.

4+4=8

14. A cam is to give the following motion to a knife - edged follower :

   (i) Outward stroke during 90° of cam rotation

   (ii) Dwell for the next 30° of cam rotation

   (iii) Return stroke during 60° of cam rotation

   (iv) Dwell for the remaining 180° of cam rotation

   The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outward stoke and return stokes. Draw the displacement diagram and profile of the cam, when the axis of the follower is passing through the axis of the cam shaft.

3+5

(OR)

(b) Design a cam for a roller follower with the following data :

   (i) Outward stroke during 120° of cam rotation

   (ii) Dwell for 30° of cam rotation

   (iii) Return stroke during 60° of cam rotation

   (iv) Dwell for the remaining part of cam rotation

   The stroke of the follower is 50 mm and the diameter of the roller is 20 mm. The minimum radius of the cam is 30 mm. The line of stroke of the followers passes through the centre of the cam axis and the outward and return strokes takes place with uniform acceleration and retardation.

3+5=8

15. *(a)* Explain the various elements of mechanical vibrating systems. 4

   (b) Explain the sources of vibrations in mechanical systems. 4

(OR)

(a) A mass of 5 kg is attached to a vertical spring and is set to vibratory motion and is measured to take 4 oscillations per second. Calculate the stiffness of spring.

4

(b) Explain any two types of damping associated with machines. 2+2=4

PART—C

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 three-speed reduction gear box is to have the following spindle speed ratio as nearly as possible. First gear 5· 2 : 1, second gear 3 : 1 and third gear 1·6 : 1, output shafts and input shafts are to be inline and the center distance which is horizontal between them and lay shaft is 150 mm. All the gears are to be 4 mm module and the number of teeth on pinion is 20. Determine the suitable number of teeth on gear wheels. Sketch thearrangement. 6+4=10

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