6056

BOARD DIPLOMA EXAMINATION, (C-16)

MAY/JUNE—2023

DME - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

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 equal forces act on a particle such that the square of their resultant is equal to the three times of their product. Find the angle between the forces. 3

2. State the parallelogram law of forces. 3

3. Define angle of repose, angle of friction, coefficient of friction. 3

4. State the laws of solid friction. 3

5. State perpendicular axis theorem. 3

6. A car starts from rest and attains a velocity of 24 m/s in 30 seconds. Find its acceleration and distance covered during this time. 1+2

7. What are impulse and recoil of gun? 1½+1½

8. Draw a neat line diagram of differential wheel and axle. 3

9. Give the expressions for mechanical advantage of first system of pulleys, second system of pulleys, third system of pulleys. 3

10. Write any three differences between machine and mechanism. 3

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 lamp weighing 5 N is suspended from the ceiling by means of a wire. It is pulled to one side by a horizontal cord, until the wire makes an angle of 60° with the ceiling. Find the tension in the wire and cord. 10

12. *(a)* Two forces of 100 N and 60 N act at a point. If the angle between the lines of action of the two forces is 60°. Determine the magnitude and direction of the resultant. 5

(b) Find the MI of rectangular lamina of 30 mm wide and 70 mm deep about its centroidal x-axis and least radius of gyration. 5

13. A body resting on a rough horizontal plane required a pull of 150 N inclined at 30° to the plane just to move it. It was found that a push of 200 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction. 10

14. For an unequal angle section having flange 125 mm × 10 mm and web 75 mm × 10 mm, find the moment of inertia about centroidal axes (I_{xx} and I_{yy}). 10

15. Find the amplitude and time period of a particle moving with SHM, which has a velocity of 9 m/s and 4 m/s at the distances of 2 m and 3 m respectively from the centre. 10

16. *(a)* If the distance between the rails of the track is 115 cm. How much must the outer rail be elevated for a curve of 250 m radius in order that the resultant force may be normal at a speed of 50 kmph? Also calculate angle of banking. 5

(b) A wheel rotating about a fixed axis at 30 rpm is uniformly accelerated for 50 seconds, during which time it makes 40 revolutions. Find the angular velocity at the end of this interval. 5

17. *(a)* What is self-locking? Mention the condition for self-locking. 3

(b) Write the law of the machine with effort versus load diagram. 3

(c) A simple machine applied an effort of 280 N to lift a load of 1400 N. Find effort lost in friction and load equivalent to friction. 4

18. *(a)* Derive an expression for velocity ratio of wheel and axle with the help of a neat sketch. 5

(b) Explain the slider crank mechanism with a neat line diagram. 5

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