C14–M–105

4054

BOARD DIPLOMA EXAMINATION, (C–14)

SEPTEMBER/OCTOBER - 2020

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. State Lami's theorem.

2. State the parallelogram law of forces.

3. State any three laws of friction.

4. Define the angle of friction.

5. Define the term moment of inertia.

6. Define the following terms :

(a) Kinematics

(b) Kinetics

7. State the D'Alembert's principle.

8. Define the following terms :

(a) Machine

(b) Efficiency

9. State the conditions for self-locking and reversibility.

10. Define the following terms :

(a) Link

(b) Kinematic pair

PART—B

10×5=50

Instructions **:** (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Find the magnitude and direction of the resultant of the concurrent forces of 8N, 12N, 15N and 20N making angles of 30°, 70°, 120° and 155° respectively with fixed horizontal line.

12. *(a)* What do you understand by equilibrium? State the conditions for equilibrium.

(b) A bar of triangular lamina of sides 100 mm × 80 mm × 60 mm is placed in such a way that its longest side is on the ground. Calculate the moment of inertia of the triangular section about its base.

13. A body of weight 100 N is to be pulled up an inclined plane whose angle of inclination with the horizontal is 20°. If the coefficient of friction between the plane and the body is 0·28, determine the effort required *(a)* when the effort is parallel to the plane and *(b)* when the effort is parallel to the base.

14. An I-section is made up of a top flange 80 mm × 20 mm, web 120 mm × 20 mm and bottom flange 100 mm × 20 mm. Determine the moment of intertia of the I-section about its centroidal axes.

15. *(a)* Define the following :

(i) Horizontal range

(ii) Time of flight

(b) A ball is projected with an initial velocity of 10 m/s at an angle 45° with the horizontal. Find the time of flight.

16. *(a)* Find the amplitude and time period of a particle moving with a simple harmonic motion, which has velocity of 9 m/s and 4 m/s at the distance of 2 m and 3 m respectively from the centre.

(b) A body is projected vertically upwards with a velocity of 12 m/s. Determine the maximum height attained by the body and the velocity at 5 m of height.

17. Derive an expression for velocity ratio of worm and worm wheel.

18. *(a)* In a simple lifting machine, an effort of 500 N raised a load of 12·5 kN. If the machine has an efficiency of 65%, determine the mechanical advantage and velocity ratio.

(b) Explain any one of the inversions of a four-bar chain with a neat diagram.

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