6056

BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

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. Define the term equilibrium. State the conditions for equilibrium of a coplanar force system.

2. Determine the horizontal and vertical components of a force 100 N, acting on a body at an angle of 30° with the horizontal axis.

3. State three laws of static friction.

4. Define the following :

    (a) Coefficient of friction

    (b) Angle of friction

5. State parallel axis theorem.

6. Define the following :

    (a) Impulse

   *(b)* Momentum

7. State law of conservation of energy.

8. What is the principle of screw jack? Write any one of its application.

9. The velocity ratio of simple machine is 8. The effort applied is 200 N. Determine the efficiency, if the load lifted is 1600 N.

10. Define kinematic chain.

PART—B

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. Four forces 20 N, $40\sqrt{2}$ N, 60 N and 80 N act on particle, inclined at 30°, 45°, 60° and 120° respectively with the horizontal. Find the magnitude and direction of their resultant. 10

12. A block rests on an inclined plane of 30°. It is prevented from sliding down by applying a pull of 500 N applied parallel to the plane. The coefficient of friction is 0.3. Find the weight of the block. 10

13. *(a)* The horizontal and vertical components of a given force are 100 N and 80 N. Find the magnitude and direction of the given force. 5

(b) Find the centroid of L-section shown in the figure. All dimensions are in mm. 5

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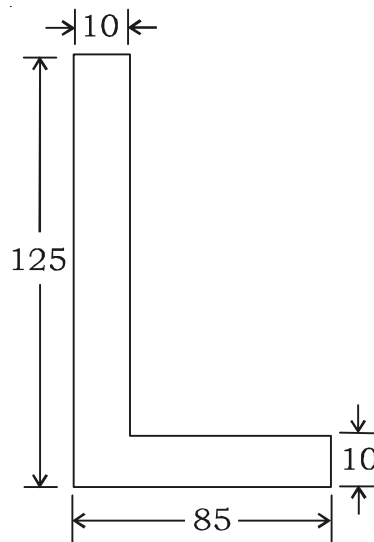
14. Find the moment of inertia of the T-section about its centroidal axes, with the following dimensions. Top flange is 60 mm × 10 mm and web is 80 mm × 10 mm.   10

15. A mass of 60 kg is raised vertically through a distance of 15 m in 60 seconds. Find *(a)* gain in potential energy of the mass and *(b)* power required to raise the mass.   10

16. A wheel rotating at 30 r.p.m. It is uniformly accelerated for 50 seconds, during which it makes 40 revolutions. Find *(a)* angular velocity at the end of this interval and *(b)* time required to attain a speed of 80 r.p.m.   10

17. The pitch of the screw jack is 15 mm and mean diameter is 60 mm. If the coefficient of friction is 0.12, calculate the force required to be applied at the end of the lever, which is 75 cm long (a) to lift a load of 4 kN and (b) to lower a load of 3 kN.   10

18. *(a)* Draw the neat sketch of simple wheel and axle and derive the expression for its velocity ratio.   5

    (b) Explain crank and slotted lever mechanism with a neat sketch.   5

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