



C16-M-105

6056

BOARD DIPLOMA EXAMINATION, (C-16)

JUNE—2019

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.

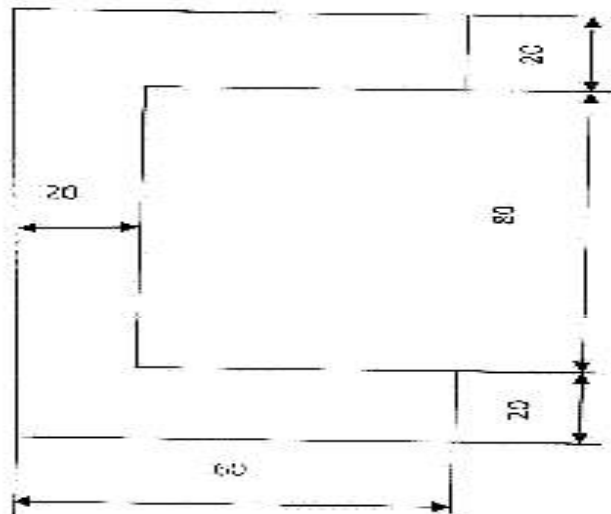
1. State the Lami's theorem.
2. Determine the magnitude and direction of the resultant of two forces 12 N and 9 N acting at a point, if the angle between the two forces is 60° .
3. Define (a) angle of friction and (b) coefficient of friction.
4. Determine the horizontal effort required to move the body weighing 90 N along a horizontal plane. The plane is such that, if it is gradually raised up to 15° , the body will slide down.
5. State the perpendicular axis theorem of moment of inertia.
6. A bullet of mass 30 g is fired horizontally with a velocity of 250 m/s from a gun of mass 25 kg. Find the velocity with which the gun will recoil.
7. Define (a) periodic time, (b) amplitude and (c) oscillation.
8. Define (a) velocity ratio and (b) mechanical advantage.

9. The law of a certain simple machine is $P = 0.04W + 2$ and its velocity ratio is 50. Calculate (a) mechanical advantage and (b) efficiency. Consider a load of 200 N.
10. Define (a) kinematic pair and (b) kinematic chain.

PART—B

10×5=50

- Instructions :** (1) Answer *any five* questions.
 (2) Each question carries **ten** marks.
 (3) Answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.
11. (a) If the maximum and minimum resultant of two forces acting on a particle are 60 kN and 20 kN respectively. Determine the magnitude of the two forces.
 (b) A weight of 80 N is suspended by two strings attached to it. One of the strings is in horizontal direction and the other is at an angle of 30° to the horizontal. Determine the tension in the two strings.
12. 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.
13. Find the moment of inertia of the following C-section about its centroidal axes. All dimensions are in mm.



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

(b) A bar of triangular lamina of sides $100 \text{ mm} \times 80 \text{ mm} \times 60 \text{ mm}$ 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.

15. (a) A car of mass 1000 kg moves on a level road under the action of 981 N of propelling force. Determine the time taken by the car to increase its velocity from 24 kmph to 48 kmph and distance travelled during this time.

(b) A body of mass 0.1 kg starts falling freely under gravity from a height of 3 m . Calculate the potential and kinetic energies of the body when it is at a height of 1 m from the ground. Assume $g = 9.81 \text{ m/s}^2$.

16. (a) A wheel rotating about a fixed axis at 30 r.p.m. is uniformly accelerated for 50 seconds during which it makes 40 revolutions. Determine—(a) angular velocity at the end of this interval and (b) time required for the speed to reach 80 r.p.m.

(b) A bullet of mass 80 gm moving with a velocity of 250 m/s is fired into a block of wood into a depth of 20 cm . Find out the resistance offered by the wood.

17. A double purchase crab has following dimensions :

Effective diameter of the load drum = 160 mm

Length of the handle = 360 mm

Number of teeth on pinions = 20 and 30

Number of teeth and spur wheels = 75 and 90

It was observed that an effort of 90 N was required to lift a load of 1800 N and an effort of 135 N was required to lift a load of 3150 N . Determine—

(a) law of machine;

(b) velocity ratio;

(c) effort required to lift a load of 6000 N ;

(d) efficiency in above case;

(e) maximum efficiency.

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- 18.(a) Explain the working of a single purchase crab winch with a neat diagram.
- (b) Explain any one of the inversions of a quadratic chain with a neat diagram.

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