



C16-M-105

6056

BOARD DIPLOMA EXAMINATION, (C-16)

OCT/NOV—2017

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 and classify the system of forces. 1+2=3
2. 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.
3. State the laws of solid friction.
4. A body of weight 100 N is placed on a horizontal plane. Determine the coefficient of friction, if a horizontal force of 60 N just causes the body to slide over the plane.
5. Define (a) centre of gravity and (b) moment of inertia. $1\frac{1}{2}+1\frac{1}{2}=3$
6. A body moving with SHM has amplitude of 0.8 m and period of complete oscillation is 2 seconds. Determine the maximum velocity and maximum acceleration.
7. State the law of conservation of momentum.

- * 8. What is self-locking? Mention the condition for self-locking.
9. 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.
10. Define (a) structure and (b) mechanism. 1½+1½=3

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. (a) The following forces act at a point
- (i) 30 kN inclined at 35° towards North of East
 - (ii) 22 kN towards North
 - (iii) 30 kN inclined at 30° towards North of West
 - (iv) 35 kN inclined at 25° towards South of West
- Find the magnitude and direction of the resultant force.
- (b) A machine weighing 5 kN is supported by two chains attached to some point on the machine. One of the chains goes to hook in the ceiling and is inclined at 45° to the horizontal. The other chain goes to the eye bolt in the wall and is inclined at 30° to the horizontal. Calculate the tensions induced in the two chains.
12. An effort of 1960 N is required to just to move a certain body up to inclined plane of angle 15°. This effort is acting parallel to the inclined plane. If the angle of inclination of the plane is made 20°, the effort required is found to be 2254 N. In this case also, the effort is parallel to the inclined plane. Find (a) weight of the body and (b) coefficient of friction.
13. 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 inertia of the I-section about its centroidal axes.

- * 14. (a) What is couple? Discuss about the classification and characteristics of a couple.
- (b) Find the moment of inertia of a rectangular lamina of 40 mm wide and 80 mm deep. Also determine the least radius of gyration.
15. A particle is moving with its acceleration directed to and proportional to its distance from a fixed point. When the distance of the particle from equilibrium position has values 1.3 m and 1.8 m, the corresponding velocities are 5 m/s and 2 m/s. Determine the (a) amplitude, (b) maximum velocity, (c) maximum acceleration and (d) time period.
16. (a) A stone is dropped from a tower and strikes the ground after 4 seconds. Find the velocity of stone at the end of 4 seconds and height of the tower.
- (b) A bullet of mass 30 g is fired into a target with a velocity of 420 m/s. It penetrates into a plank through 3 cm. Find the resistance offered by the plank.
17. In a differential wheel and axle, the difference between axle diameter is 40 mm and the diameter of the effort wheel is 600 mm. If a load of 2600 N is lifted by a load of 150 N and a load of 3200 N is lifted by an effort of 200 N, determine (a) law of the machine, (b) velocity ratio, (c) load lifted by an effort of 250 N, (d) mechanical advantage, (e) efficiency and (f) effort wasted in friction.
- * 18. (a) What is a lever? Illustrate the types of lever with examples.
- (b) Explain Whitworth quick return mechanism with a neat diagram.
