7053 *

C20-M–105

7053

BOARD DIPLOMA EXAMINATION, (C-20)

FEBRUARY/MARCH —2022

DME - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 hours] [*Total Marks* : 80

PART—A

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 a couple and write any four practical applications of a couple. 1+2=3

2. State Triangle law of forces and draw a system of forces diagram which depicts Triangle law. 2+1=3

3. State laws of solid friction. 3

*

4. Define the following terms : 1½×2=3

(a) Angle of friction

(b) Angle of repose

5. Find the moment of inertia of a rectangular lamina of 30 mm wide and 90 mm deep about a line 10 mm below its centroidal line and parallel to 30 mm edge. 3

*

6. State perpendicular axis theorem. 3

7. Define the terms rest and motion. 3

8. A bullet of mass 25 gm is fired with a velocity of 350 m/s. It penetrates into a plank through 3 cm. Compute the resistance offered by the plank. 3

9. Classify kinematic pairs depends on nature of relative motion between the links. 3

10. Draw the line diagrams of three kinds of levers indicating position of load, effort and fulcrum. 3

PART—B

Instructions : (1) Answer **all** questions.

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

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

11. *(a)* Write the conditions of equilibrium of a rigid body which is subjected to system of coplanar forces.

Three forces acting on a particle are in equilibrium. Angle between first two forces is 90° and the angle between second and third is 120°. Find the ratio of the forces. 3+5=8

(OR)

(b) State Parallelogram law of forces.

Two forces 2 kN and 1 kN act on a particle. The angle between them is 60°. Find the magnitude and direction of third force which shall bring the system into equilibrium. 3+5=8

12. *(a)* A body of weight 2000 N is to be pulled up on an inclined plane of angle 28°. The coefficient of friction between body and plane is 0.26. Draw the diagrams and find the effort required when it is *(i)* parallel to base and *(ii)* inclined to plane at 15°. 8

(solve by using Lami's theorem only)

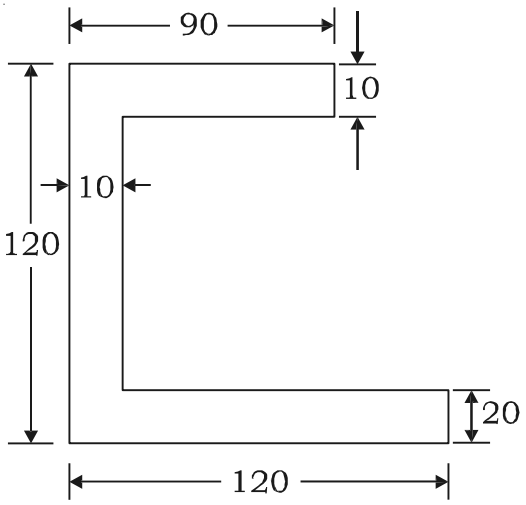
(OR)

(b) A body resting on a rough horizontal plane requires a pull of 150 N inclined at 30° to the plane just to move it. It was found that a push of 190 N inclined 35° to the plane just moved the body. Determine the weight of the body and coefficient of friction. 8

13. *(a)* State Parallel axis theorem.
Find the centroid of an I-section, which is made up of top flange 70 × 18 mm, web 120 × 16 mm and bottom flange 100 × 12 mm. 3+5=8

(OR)

(b) Find the moment of inertia of the section shown in the figure below about its centroidal axis parallel to the base : 8



14. *(a)* A body is moving with uniform acceleration. In eleventh second it covered 7.2 m and in fifteenth second it covered 9.6 m. Find the initial velocity and the acceleration with which it moves. 8

(OR)

(b) Write any three differences between weight and mass.
A body falling freely under the action of gravity passes two points 10 meters apart vertically in 0.2 seconds. From what height above the higher point did it start to fall? (Take g=9.8 m/s^2) 3+5=8

15. (a) State the condition for self-locking.
A simple machine applied an effort of 270 N to lift a load of 1350 N. Its velocity ratio is 8. Find (i) effort lost in friction, (ii) load equivalent of friction and (iii) efficiency. 2+2+2+2=8

(OR)

(b) Define constrained motion and explain three types of constrained motions with examples. 8

PART—C

Instructions : (1) Answer the following question.

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

16. In first system of pulleys there are three movable pulleys and one fixed pulley of radius 7 cm. Draw a neat sketch and calculate the distance moved by load, distance moved by effort, distance moved by middle movable pulley and velocity ratio for one complete rotation of fixed pulley. 3+2+1+2+2=10

★ ★ ★