7053 *

C20-M–105

# 7053

BOARD DIPLOMA EXAMINATION, (C-20)

JANUARY—2023

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 Resultant and Resolution of forces.

2. State Lami's theorem with expression and draw a system of forces which represents the Lami's theorem.

3. Define friction. Classify types of friction.

4. Define the following terms :

   *(a)* Normal reaction

   *(b)* Coefficient of friction

5. State the differences between centroid and centre of gravity.



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6. State perpendicular axis theorem.

7. A body moving with a velocity of 12 m/sec and attains speed of 85 m/sec in 10 seconds. Find the acceleration and distance travelled.

8. A sphere of mass 30 kg moving at 3 m/s over takes and colloids with another sphere of mass 20 kg moving at 1 m/s in the same direction. Find the common velocity after impact.

9. Define machine and mechanism.

10. 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.

## PART—B

Instructions : (1) Answer all questions.

(2) Each question carries eight marks.

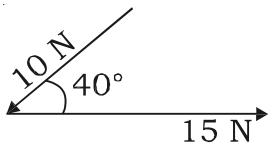
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Classify the system of forces and explain them in detail. 8

( OR )

*(b)* *(i)* State parallelogram law. 3

*(ii)* Find the magnitude and direction of the resultant of two forces acting as shown in below Fig. 5

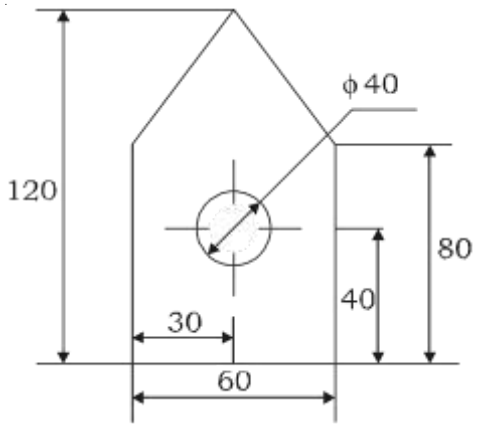


12. *(a)* A body of weight 735 N rest on a rough inclined plane. The plane is inclined at an angle 30° with the horizontal and the angle of friction between the body and plane is 15°. Find the horizontal force required to hold the body from sliding down the plane. 8

( OR )

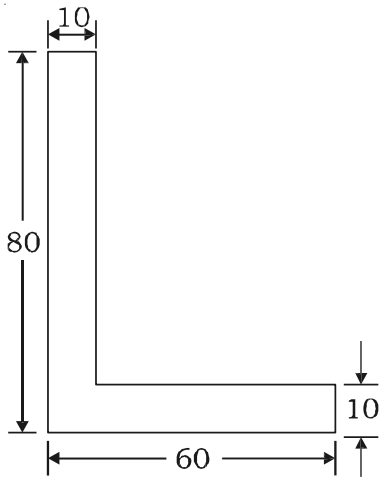
*(b)* A body resting on a horizontal plane requires a pull of 18 kN inclined at 30° to the plane to just move it. It is also found a push of 22 kN inclined at 30° to the plane just moved the body. Determine the weight of the body and coefficient of friction. 8

13. *(a)* Find the centroid of the composite figure given below. All dimensions are in mm.




( OR )

*b)* Find the moment of inertia of the angle section as shown in figure about *XX* and *YY* axis passing through its CG. All dimensions are in mm.



14. *(b)* *(i)* State the Newton's second law of motion. 3

*(ii)* A body of mass 50 kg is initially at rest and attains a speed of 2 m/s in 5 seconds. Find the force causing the motion. What is the displacement of a body in these 5 seconds? 5

( OR )

*(b)* *(i)* State work-energy principle. 3

*(ii)* A bullet, of mass 0·1 kg, is fired into a target with a velocity of 350 m/s. The mass of the target is 10 kg and it is free to move. Find the loss of kinetic energy. 5

15. *(b)* *(i)* Define simple machine. 3

*(ii)* A simple machine applied an effort of 280 N to lift a load of 1400 N. Its velocity ratio is 10. Find (*A*) effort lost in friction, (*B*) load equivalent of friction and (*C*) efficiency. 5

( OR )

*(b)* In a lifting machine, an effort of 98 N lifts a load of 2450 N and an effort of 127·4 N lifts a load of 3920 N. Establish the law machine. Calculate *(i)* the effort required to lift a load of 5880 N and *(ii)* the load that can be lifted using an effort of 196 N. 8

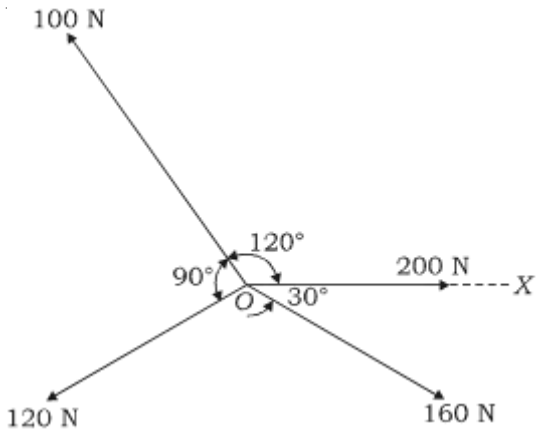
* PART—C 10×1=1

Instructions : (1) Answer the following question.

(2) The question carries ten marks.

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

16. Determine analytically the magnitude and direction of the equillibrant of the forces shown in below figure. State the angle made by it with *OX*.

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