C16-M–**105**

6056

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER/NOVEMBER—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 and write the units of *(a)* force and *(b)* moment of force.

2. Define the free-body diagram.

3. State the laws of dry friction.

4. Define angle of friction.

5. Define centre of gravity.

6. Define *(a)* displacement, *(b)* velocity and *(c)* acceleration.

7. State D' Alembert's principle.

8. Define *(a)* mechanical advantage, *(b)* velocity ratio of simple machines.

9. Write the expression for the velocity ratio of *(a)* wheel and axle and *(b)* first order pulley system.

10. Write the differences between machine and structure.

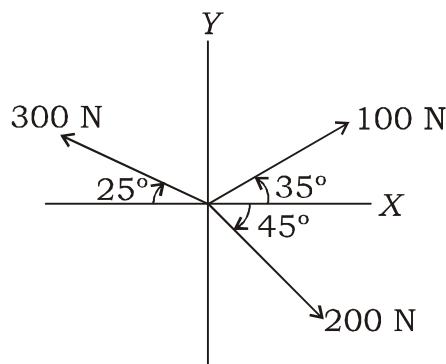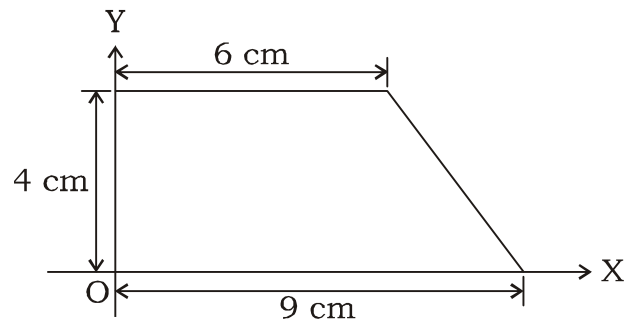**PART—B**   10×5=50

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. *(a)* Three forces are concurrent at the origin as shown in figure. Determine the resultant of the three forces.
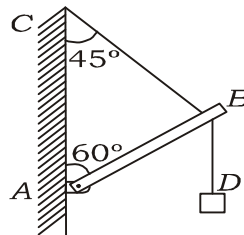

(b) Find the centroid of the area shown in figure.

12. A strut *AB* supporting a block of weight 500 N is held by a cable *BC* as shown in figure. Find the tension *T* in the cable *BC* and the force *S* in the strut *AB*. Neglect weight of the strut.
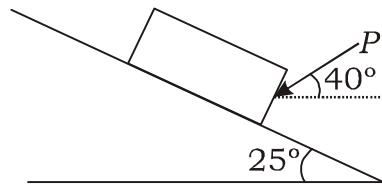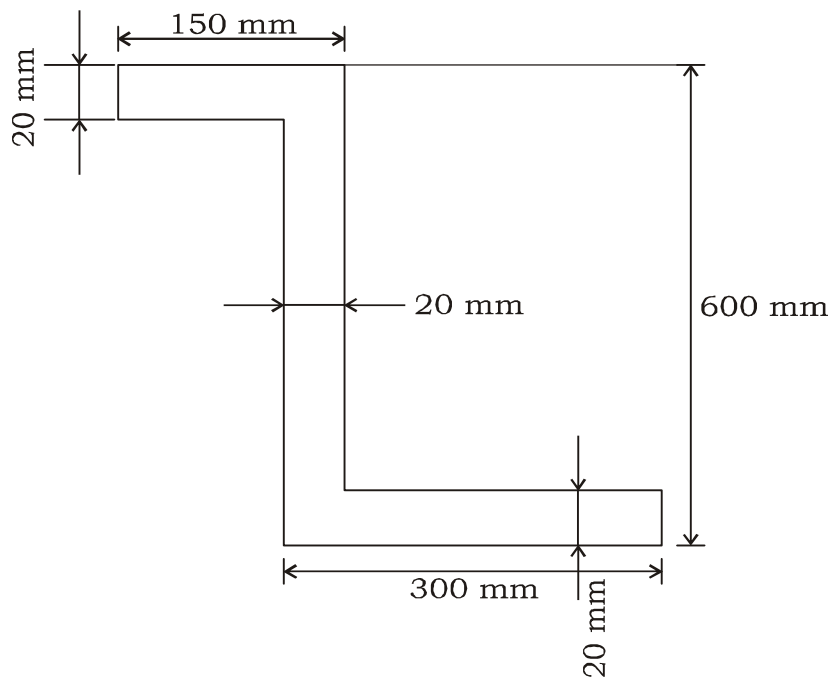
13. A block weighing 200 N must be pushed up a plane inclined by 25° to the horizontal as shown in figure. Find the value of *P* required if it is inclined at 40° to the horizontal. The coefficient of friction between the contract surface is 0·2.

14. Calculate the moment of inertia of the area shown in figure about its horizontal centroidal axis.

15. The speed of a truck moving at a constant speed of 30 m/s is reduced to 20 m/s in a distance of 200 m. Determine *(a)* the acceleration assuming it to be constant and *(b)* the time taken. Also, determine the distance in which the truck can be brought to a stop with the acceleration calculated in part *(a)*.

16. A bullet of mass 80 grams moving with a velocity of 250 m/s is fired into a block of wood into a depth of 20 cm. What will be the resistance offered by the wood.

17. In a simple machine, whose velocity ratio is 30, a load of 2400 N is lifted by an effort of 150 N and a load of 3000 N is lifted by an effort of 180 N. Find the law of machine and calculate the load that could be lifted by a force of 200 N. Calculate also the following :

(a) The amount of effort wasted in overcoming the friction

(b) Mechanical advantage

(c) The efficiency

18. *(a)* Draw the first order pulley system and write its velocity ratio.

(b) Draw the neat sketches of lower kinematic pairs and write their degree for freedom.

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