



C09-M-303

**3247**

**BOARD DIPLOMA EXAMINATION, (C-09)  
MARCH/APRIL—2017  
DME—THIRD SEMESTER 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 'equilibrant' of a force system.
2. Write any three characteristics of a couple.
3. Define law of conservation of momentum.
4. Write a short note on significance of friction.
5. List out three practical examples of each sliding friction and rolling friction.
6. Define mechanical advantage and velocity ratio.
7. Define reversible machine and irreversible machine.
8. Define (a) centre of gravity and (b) centroid.
9. Find the moment of inertia of the rectangular lamina of 60 mm wide and 100 mm deep about its CG.
10. Differentiate the terms '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 the criterion for valuation is the content but not the length of the answer.

- 11.** The forces acting at a point on a body are shown in Fig. 1 below. Determine the magnitude and directions of resultant.

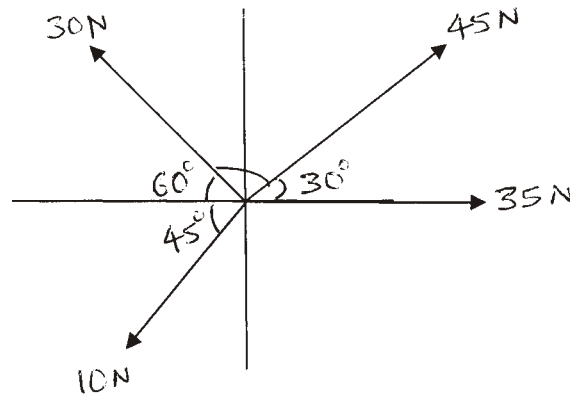
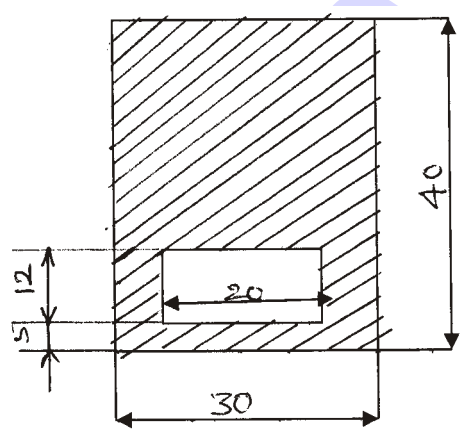


Fig. 1

- 12.** Explain the law of conservation of energy in the case of freely falling body (or) Explain the total energy of a freely falling body.
- 13.** A mass of 50 kg is pulled up a rough inclined plane, whose inclination to the horizontal is 30° by a force of 354 N acting parallel to the plane. Find the coefficient of friction. Solve by resolution of forces. Take  $g = 9.81 \text{ m/s}^2$ .
- 14.** A screw jack has a pitch of 12 mm and mean radius of 50 mm. The coefficient of friction between screw and nut is 0.15 and the effort is applied at the end of a handle 750 mm long. Determine effort required to raise a load of 30 kN.
- 15.** In a differential pulley block, radii of concentric pulleys are 150 mm and 100 mm. It has been found that an effort of 200 N can lift a load of 1000 N. Calculate the efficiency of the machine.

- \* 16. (a) Explain Lami's theorem and derive the expression for it.  
 (b) In a lifting machine, an effort of 400 N raised a load of 10000 N. What is mechanical advantage, if the efficiency is 80%, what will be the velocity ratio?
17. The details of a hollow rectangular section are given below :  
 External dimension—150 mm × 180 mm  
 Internal dimension—75 mm × 90 mm  
 Calculate the MI of the section about its centroidal axis.
18. (a) Describe Whitworth quick return mechanism with a legible sketch.  
 (b) Find the centroid of shaded area shown in Fig. 2 below :



All dimensions are in mm

Fig. 2

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