



C20-M-105

7053

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER / NOVEMBER—2024

DME – FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 Hours ]

[ Total Marks : 80

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**PART—A**

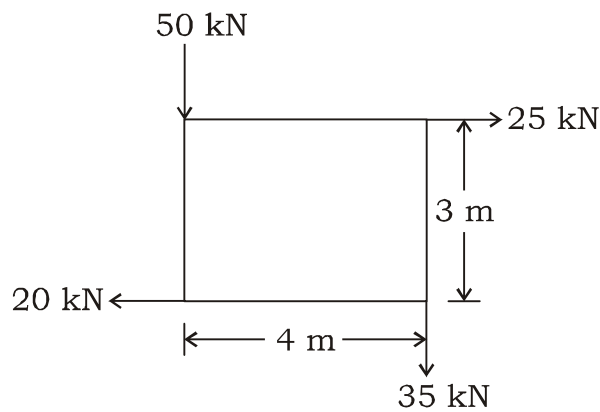
3×10=30

- 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. What are the characteristics of force and represent on line diagram?
2. State the necessary and sufficient conditions for equilibrium of rigid bodies in two dimensions.
3. List out different types of friction.
4. What is meant by angle of repose?
5. State perpendicular axis theorem.
6. State the necessity of finding moment of inertia.
7. Define the following terms “
  - (a) Displacement
  - (b) Velocity
  - (c) Acceleration
8. Give any three examples of rotary motion in daily life.
9. Define the terms (a) ideal load, (b) ideal effort and (c) ideal machine.
10. Give examples for lower pair and higher pair.

- 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)** A system of forces are acting at the corners of a rectangular block as shown in Figure. Determine the magnitude and direction of the resultant force.



(OR)

- (b) State and prove parallelogram law of forces.

- 12. (a)** A body of weight  $W$  is in equilibrium on a rough inclined plane, of an angle  $\alpha$ , under the action of a upward pull  $P$  applied parallel to the inclined plane. Write the equations for friction, normal reaction and coefficient of friction. Assume limiting conditions.

(OR)

- (b) A body weighing 570 N hauled along a rough horizontal plane by a pull acting at an angle  $30^\circ$  with the horizontal. The coefficient of friction between the body and plane is 0.28. Determine the pull acting on the body.

- 13. (a)** Find the moment of inertia of a T-section with flange as  $150 \text{ mm} \times 50 \text{ mm}$  and web as  $150 \text{ mm} \times 50 \text{ mm}$  about X-X and Y-Y axes through the centre of gravity of the section.

(OR)

(b) An I-section is made up of top flange 100 mm × 20 mm, web 120 mm × 30 mm and bottom flange 160 mm × 30 mm. Determine moment of inertia about centroidal axis  $I_{xx}$  and  $I_{yy}$ .

14. (a) A stone is dropped from the top of tower 100 m high. Another stone is projected upward at the same time from the foot of the tower, and meets the first stone at a height of 40 m. Find the velocity, with which the second stone is projected upwards.

(OR)

(b) A bullet of a gun of mass 0.05 kg and is fired with a velocity of 300 m/s. What is the kinetic energy of the bullet? If the bullet penetrates into a block of wood 300 mm deep, what is the resistance offered by wood to the bullet? What is the exit velocity of the bullet if the same bullet is fired into a similar block of wood of 200 mm thick?

15. (a) Explain any one of the inversions of a quadratic chain with a neat diagram.

(OR)

(b) In a differential wheel and axle the diameter of wheel is 250 mm. The larger and smaller diameters of the differential axle are 100 mm and 90 mm respectively. An effort of 30 N is applied to lift a load of 900 N, find (i) velocity ratio, (ii) mechanical advantage and (iii) efficiency.

### PART—C

10×1=10

**Instructions :** (1) Answer the following question.  
(2) The question carries **ten** marks.  
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. Identify any 5 types of kinematic pairs in real world applications and write short note on these kinematic pairs.

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