3E1207

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**3E1207**

**B.Tech. III-Sem. (Main/Back) Examination, January- 2025**
**Automobile Engg.**
**3AE3-04 Engineering Mechanics**
**AE, ME**

**Time : 3 Hours** **Maximum Marks : 70**

***Instructions to Candidates:***

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No.205)*

## PART - A

**(Answer should be given up to 25 words only)**

**All questions are compulsory.** **(10×2=20)**

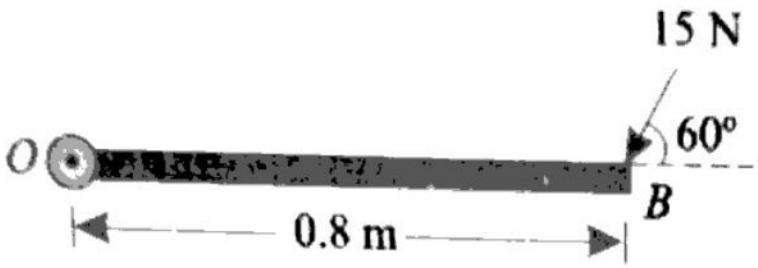
1. Differentiate centroid and center of gravity.
2. Two forces of 100 N and 150 N are acting simultaneously at a point. What is the resultant of these two forces, if the angle between them is $45^0$ ?
3. State the Lami's theorem with diagram.
4. State the D-Alembert's principle.
5. Define principles of transmissibility
6. State parallel axis theorem?
7. State the principle of impulse-momentum?
8. State the Law of machine?

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9. A force of 15 N is applied at an angle of 60° to the edge of a door 0.8 m wide as shown in Fig. Find the moment of the force about the hinge (O).



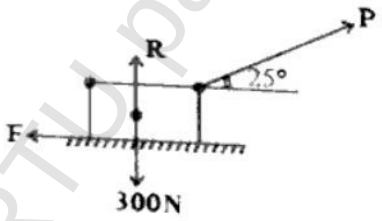

10. Write the principle of virtual work.

## PART - B

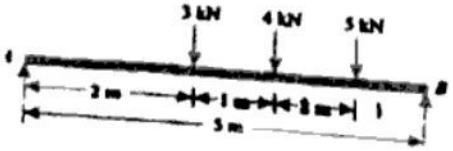
### (Analytical/Problem solving questions)

**Attempt any Five questions.** **(5×4=20)**

1. A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3. Find the magnitude of the force (P), which can move the body, while acting at an angle of 25° with the horizontal.

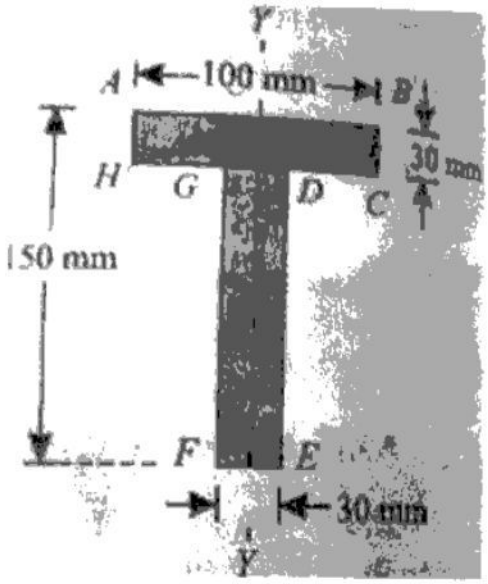



2. A simply supported beam AB of span 5 m is loaded as shown in Fig. Find the reactions at A and B.




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3. Find the centre of gravity of a 100 mm × 150 mm × 30 mm T-section.



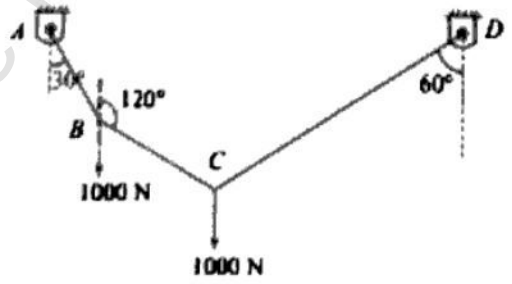

4. In a certain weight lifting machine, a weight of 1 kN is lifted by an effort of 25N. While the weight moves up by 100mm, the point of application of effort moves by 8 m. Find mechanical advantage, velocity ratio and efficiency of the machine.
5. Derive the expression for time of flight of a projectile on a horizontal plane?
6. A ball of mass 1 kg moving with a velocity of 2 m/s impinges directly on a ball of mass 2 kg at rest. The first ball, after impinging, comes to rest. Find the velocity of the second ball after the impact and the coefficient of restitution.
7. A circular wheel of mass 50 kg and radius 200 mm is rotating at 300 r.p.m. Find its kinetic energy.

## PART - C

**(Descriptive/Analytical/Problem Solving/Design questions)**

**Attempt any Three questions.** **(3×10=30)**

1. Derive the equation for the length of a cross-belt drive?
2. A string ABCD, attached to fixed points A and D has two equal weights of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles as shown in Fig. Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is $120^0$.

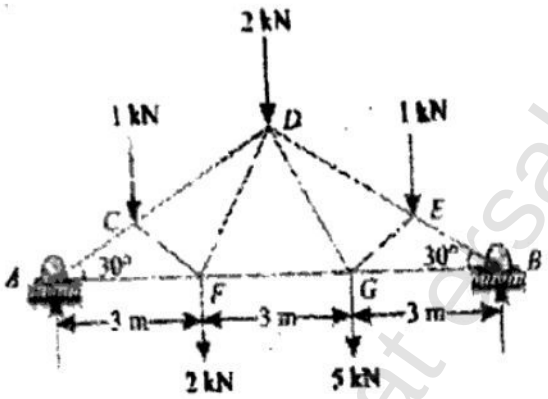



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3. Derive the expression for moment of inertia of a rectangular section?

4. A body of mass 0.5 kg tied to string is whirled in a vertical circle making 2 rev/s. If radius of the circle is 1.2m, then find tensions in the string when the body is at top of the circle, and (ii) at the botton of the circle.

5. A truss of 9 m span is loaded as shown in Fig. Find the reactions at the two supports.




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