

EVENING
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[Total No. of Questions: 09]

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Uni. Roll No.

Program/ Course: B.Tech. (Sem. 3rd)
Name of Subject: Engineering Mechanics
Subject Code: ESME-101
Paper ID: 16071

Max. Marks: 60

Time Allowed: 03 Hours

NOTE:

- 1) Parts-A and B are compulsory
- 2) Part – C has two Questions Q8 and Q9 .Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

[Marks: 02 each]

Part – A

Q1.

- a) What are the conditions under which the centre of gravity of a body becomes the same as its centroid?
- b) State the work-energy equation for translation.
- c) Define a Free Body Diagram. Give two examples.
- d) Find the product of inertia of a rectangle of sides that lie along its two sides.
- e) Write Impulse-Momentum equation.
- f) Define equilibrium of a body and give conditions of equilibrium when subjected to forces.

Part – B

[Marks: 04 each]

Q2) A block weighing 100 N is resting on a rough plane inclined 20° to the horizontal. It is acted upon by a force of 50N directed upward at angle of 140° above the plane. Determine the friction. If the block is about to move up the plane, determine the co-efficient of friction.

Q3) A uniform ladder of weight 800N and of length 7 m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 60°. When a man of weight 600N stands on the ladder at a distance 4m from the top of the ladder, the ladder is at the point of sliding. Determine the coefficient of friction between the ladder and the floor.

Q4) State and prove the perpendicular axis theorem.

Q5) Determine the force exerted by the floor of the lift on a passenger of 75kg mass, when the lift is (i) accelerating upwards at 1m/s^2 and (ii) accelerating downwards at 0.9m/s^2 .

Q6) A car starts with a velocity u and travelling at uniform acceleration covers 36.5 m during 5th sec and 61.5 m during 10th sec. determine the starting velocity and the value of uniform acceleration.

Q7) Explain various force systems with neat sketches.

Part - C [Marks: 12 each]

Q8) Figure 1 shows the cross-section of a cast iron beam

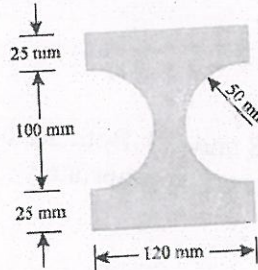


Fig.1

Determine the moments of inertia of the section about horizontal and vertical axes passing through the centroid of the section

Or

Explain Varignon's Principle of Moments (Or Law of Moments) theorem and State and Prove Lami's theorem.

Q9) A cylindrical roller 500 mm diameter is in contact with two conveyor belts at its top and bottom as shown in fig.2. If the belts A and B run at uniform speeds of 5 m/s and 3 m/s, find the linear velocity and the angular velocity of the roller.

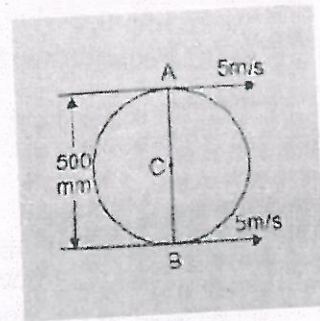


Fig.2

Or

A load of 1.5 kN, resting on an inclined rough plane, can be moved up the plane by a force of 2 kN applied horizontally or by a force 1.25 kN applied parallel to the plane. Find the inclination of the plane and the coefficient of friction.
