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(Pages : 3)

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COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

EN 04 107 (B)—ENGINEERING MECHANICS—B

(2004 admissions)

[For ME, PE, AM]

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Explain how a force can be translated to a given point without affecting its action on the body.

(b) What is meant by "Static indeterminacy" ? Explain how it is determined for a structure.

(c) Distinguish between Static friction and Dynamic friction.

(d) The cable shown in Fig. 1 carries a load of 100 kN uniformly distributed with respect to the horizontal span. Determine the maximum tension in the cable.

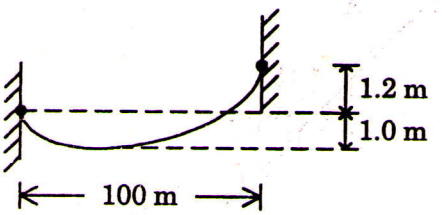

Fig. 1

(e) A body starts to move vertically upward under the influence of gravity with an initial velocity of 20 m/s. Find the maximum height to which it will rise, and the time required for it to return to its initial position.

(f) What do you mean by "instantaneous centre of rotation" ? How will you locate it ?

(g) A spherical mass approaching with a velocity V strikes an identical spherical mass at rest. What would be their final velocities if the impact was (i) perfectly elastic ; (ii) perfectly plastic.

(h) A uniform homogeneous cylinder of weight 10 N rolls without slip along a horizontal level surface with a translational velocity of 10 cm./s. If its radius is 5 cm., what is its total kinetic energy ?

(8 × 5 = 40 marks)

Turn over

2. (a) A symmetrical truss is loaded by five forces as shown in Fig. 2. Use vector approach to obtain the resultant load and its line of action.

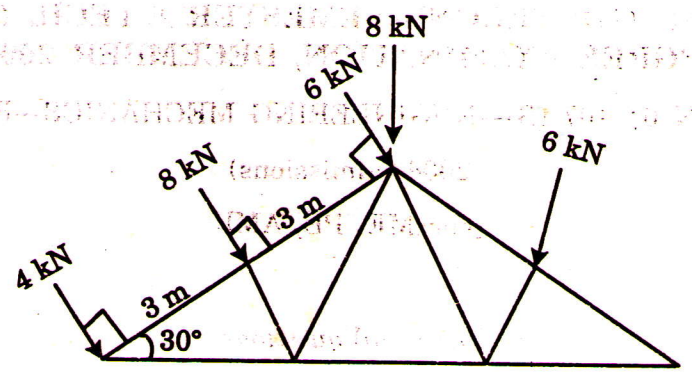

Fig. 2

Or

(b) A 100-kN roller rests on a smooth inclined plane and is kept from rolling down by a string AC as shown in Fig. 3. Find the tension in the string and the reaction at the point of contact B.

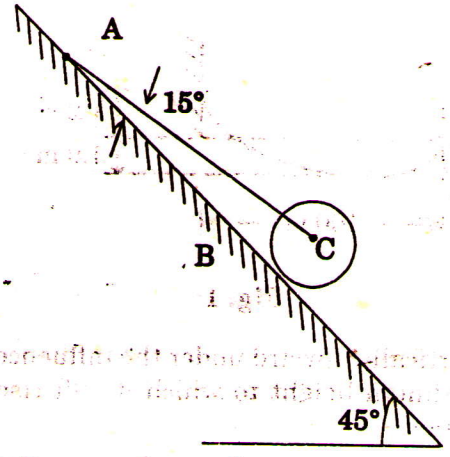

Fig. 3

(15 marks)

3. (a) Determine I_{xx} and I_{yy} of the lamina shown in Fig. 4. (on page 3) Radius of the semicircle is 50 mm.

Or

(b) A uniform ladder of length 30 m. rests against a vertical wall making an angle of 50° to it. A man whose weight is half that of the ladder ascends the ladder. How far up the ladder will the man be when the ladder just slips ? Coefficient of friction between ladder and wall is 0·35 and that between ladder and ground is 0·5.

(15 marks)