

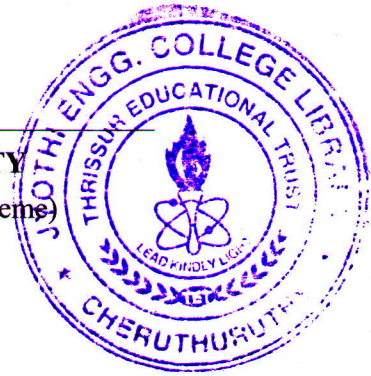
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1,S2 (S,FE) Examination May 2021 (2015 Scheme)



Course Code: BE100

Course Name: ENGINEERING MECHANICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks

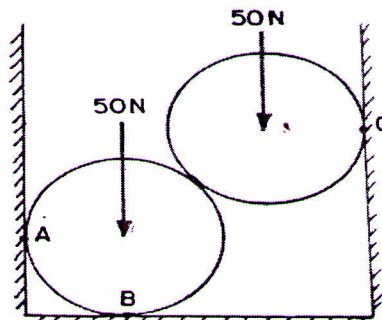
- | | | Marks |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1 | Explain composition and resolution of coplanar forces with figure. | (5) |
| 2 | What are the different type's loads acting on a beam with figure? | (5) |
| 3 | State "Theorems of Pappus-Guldinus". | (5) |
| 4 | What is Virtual Work? Write Principle of virtual Work. | (5) |
| 5 | A lift has an upward acceleration of 1.5 m/sec^2 . What force will a man weighing 500N exerts on the floor of the lift? What force would he exert if the lift had an acceleration of 1.5 m/sec^2 downwards? | (5) |
| 6 | Give a note on types of motion | (5) |
| 7 | Explain Amplitude, Period and Oscillation. | (5) |
| 8 | Derive the equivalent stiffness for springs attached to the mass in series and in parallel? | (5) |

PART B

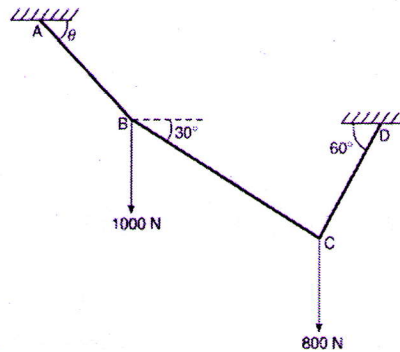
Answer any 2 questions from each SET, each question carries 10 marks.

SET I

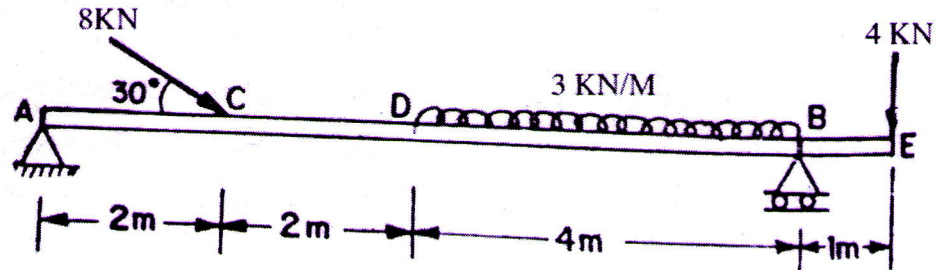
- 9 Two spheres, each of weight 50N and of radius 100 mm rest in a horizontal channel of width 360mm as shown. Find the reactions on the points of contact A, B and C. (10)



- 10 Compute the tensions in the strings AB, BC and CD as shown in Figure (10)

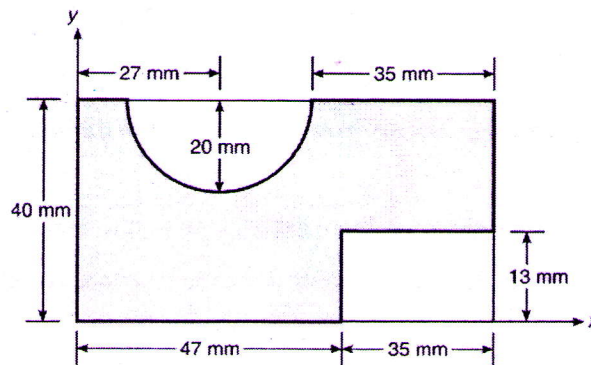


- 11 A beam is loaded shown in figure. Determine reaction at both ends. (10)



SET II

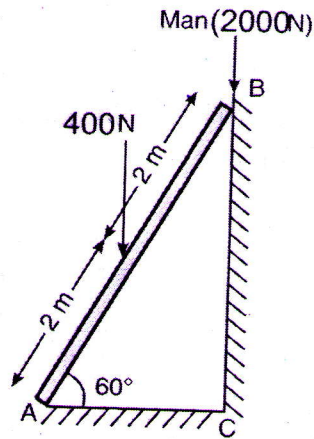
- 12 Locate the centroid of the shaded area. (10)



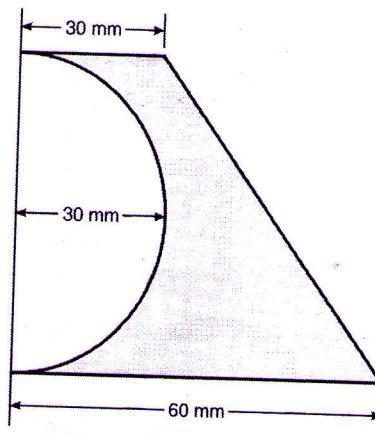
- 13 A uniform ladder 4 m long weighs 400 N. It is placed against a wall making an angle of 60° with the floor as shown in Figure. The coefficient of friction between the wall and the ladder is 0.25 and that between the ground and the ladder is 0.35. The ladder in addition to its own weight, has to support a man of 2000 N at the top at B. Calculate: (5)
- i) The horizontal force P to be applied to the ladder at the ground level to prevent slipping.

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- ii) If the force P is not applied, what should be the minimum inclination of the ladder with the horizontal, so that it does not slip with the man at the top? (5)



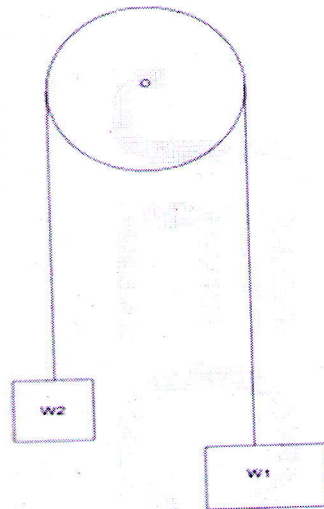
- 14 a) Calculate the moment of inertia of the shaded area in the figure with respect to the centroidal axes. (10)



SET III

- 15 a) A lift carries a weight of 110 N and is moving with a uniform acceleration of 3m/s^2 . Determine the tension in the cables supporting the lift, when (5)
- lift is moving upwards
 - lift is moving downwards. Take $g=9.80\text{ m/s}^2$
- b) The piston of an IC engine moves with simple harmonic motion. The crank rotates at 500 rpm and the stroke length is 50 cm. Find the velocity and acceleration of the piston when it is at a distance of 15 cm from the mean position. (5)
- 16 (a) State D' Alembert's principle and illustrate this principle by considering the motion of two bodies connected by a string shown in figure. (10)

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- 17 A body, moving with simple harmonic motion, has amplitude of 1.5m and period of oscillation is 3 seconds. Find the velocity and acceleration of the body at $t=0.5$ second, when time is measured from, (i) the mean position and (ii) the extreme position. (10)
