Reg No.:_____       Name:_____

## APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2 (S) / S2 (FE) Examination May 2022 (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 | (a) | Explain the term Simple harmonic motion | (5) |
| 2 | (a) | Explain the law of transmissibility of Forces and principle of superposition with proper diagrams | (5) |
| 3 | (a) | Explain the terms Limiting friction, angle of repose and cone of friction with diagrams | (5) |
| 4 | (a) | Explain the terms frequency, time period and stiffness of a spring | (5) |
| 5 | (a) | State and explain D'Alembert's Principle | (5) |
| 6 | (a) | Calculate the moment of inertia of a square of side 'a' placed with one of its diagonal horizontal. | (5) |
| 7 | (a) | Explain the term degree of freedom | (5) |
| 8 | (a) | Differentiate between free vibrations and forced vibrations | (5) |

### PART B

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

#### SET I

9 (a) Two Cables AB and AC are attached at A as shown. Determine the resultant of   (10) two cables, if the tension is 200 N in the cable AB and 1500 in cable AC.
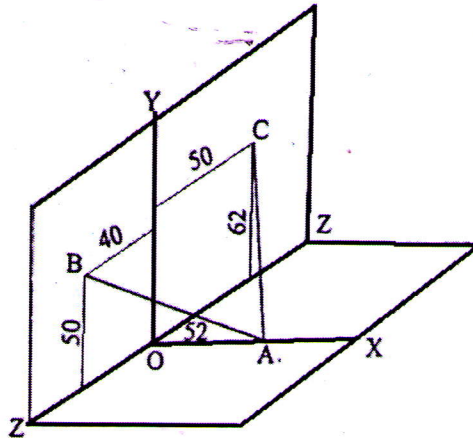


10 (a) A Slender bar AB of weight 100 N and length 6 m rests on a small roller at D.   (5)

the end A rests on a smooth vertical wall as shown. Calculate the angle θ that the bar makes with horizontal for conditions of equilibrium.
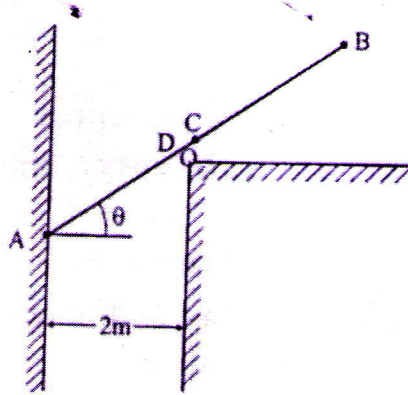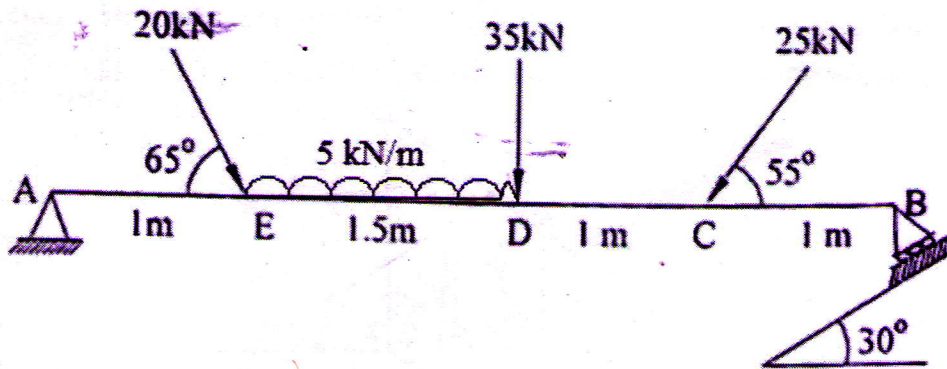


(b) A roller of weight W = 1000 N rests on a smooth inclined plane and is kept from rolling down by a string AC as shown. Find the tension S in the string and reaction at the point of contact B.     (5)
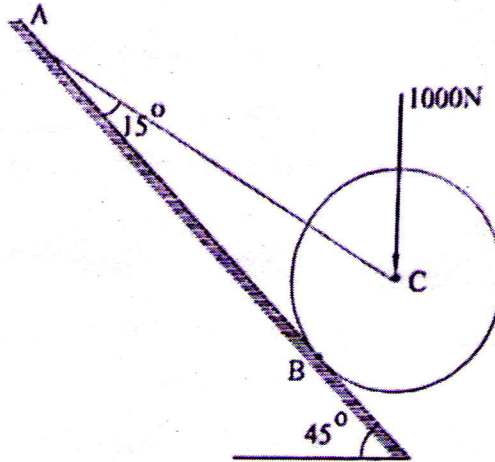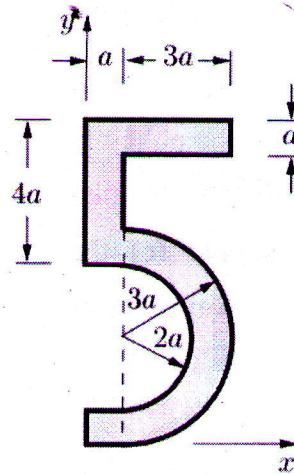


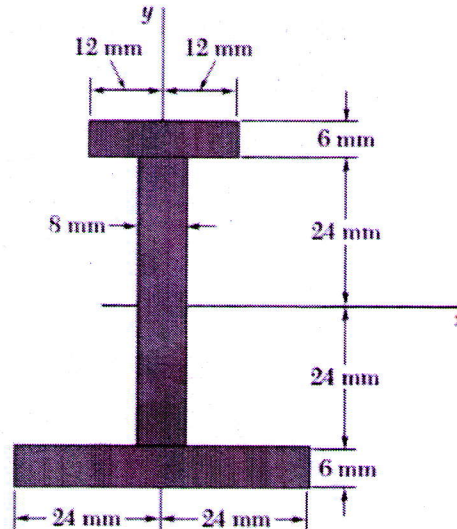11      Determine the reactions at the support of the beam.     (10)

## SET II

12      Determine the coordinates of the centroid C of the number shown.      (10)

13   a)   Determine the moment of inertia and the radius of gyration of the area shown      (10)
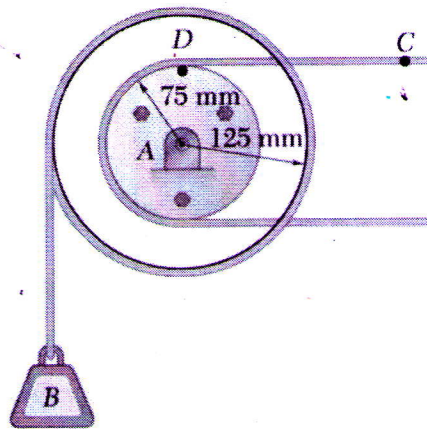         about x axis shown.

14.  a)   Find the least P required to move the block. Coefficient of Static Friction for      (10)
         both pairs of wedge = 0.3 Coefficient of Static Friction between block and
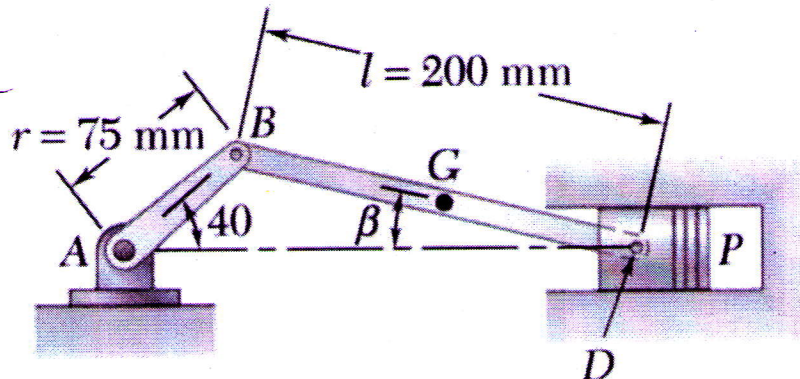         horizontal surface = 0.6.
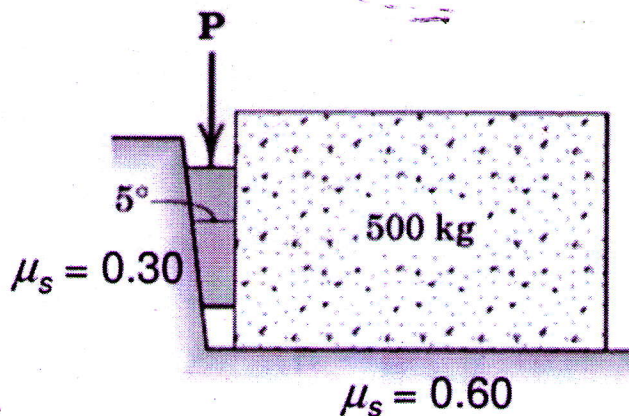
**SET III**

15  (a)  Cable C has a constant acceleration of 225 mm/s$^2$ and an initial velocity of 300 mm/s, both directed to the right. Determine (a) the number of revolutions of the pulley in 2 s, (b) the velocity and change in position of the load B after 2 s, and (c) the acceleration of the point D on the rim of the inner pulley at t = 0.          (10)

16  (a)  The crank AB has a constant clockwise angular velocity of 2000 rpm. For the crank position indicated, determine (a) the angular velocity of the connecting rod BD, and (b) the velocity of the piston P. Use method of instantaneous center of rotation.          (10)

17  (a)  A body of mass 50 kg is suspended by two springs of stiffness 4kN/m and 6 kN/m as shown. The body is pulled 50 mm from its equilibrium position and then released. Calculate (i) the frequency of oscillation, (ii)maximum velocity and (iii) maximum acceleration in each case.          (10)

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