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Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech examinations (S) September 2020 S1/S2 (2015 Scheme)

Course Code: BE 100
Course Name: ENGINEERING MECHANICS

Max. Marks: 100   Duration: 3 Hours

PART A (ANSWER ALL QUESTIONS: 8 X 5 = 40 MARKS)

1   F_1 and F_2 are two collinear forces. When they act in opposite directions, their   (5)
     resultant is 34N, when they act at right angles to each other, their resultant is
     50N. Find F_1 and F_2.

2   Explain free body diagram with an example.   (5)

3   Define Radius of gyration, product of inertia and principal moment of inertia.   (5)

4   Using principle of virtual work determine the support reactions at A and B of   (5)
   the beam shown below.
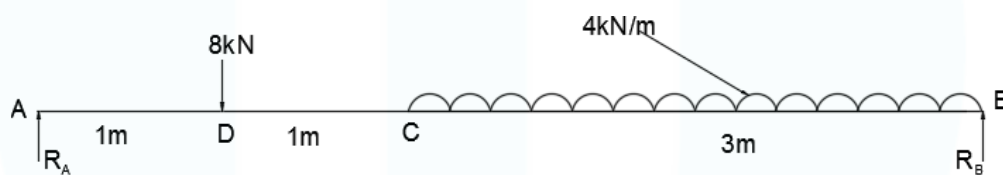
5   Show that the acceleration at any instant during simple harmonic motion is   (5)
     directly proportional to the displacement from the mean position.

6   What do you mean by a seconds pendulum?The length of a seconds pendulum   (5)
     is increased by 1%.How much time will it gain or lose per day?

7   State D'Alemberts principle. Draw the free body diagram of a lift of weight   (5)
     'W', moving upwards with an acceleration 'a' and also write the equations of
     dynamic equilibrium using this principle.

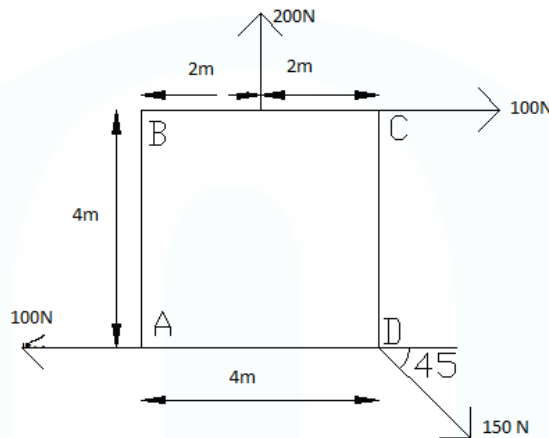8   What is instantaneous centre? How can it be located?   (5)

PART B
SET I
(ANSWER ANY 2 QUESTIONS : 2 X 10 = 20 MARKS)

9.   a)   State and prove Varignon's theorem.   (5)

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b) A rigid bar AB is acted by forces as shown in figure below. Reduce the system into (i) a single force, (ii) Force moment system at A. (5)
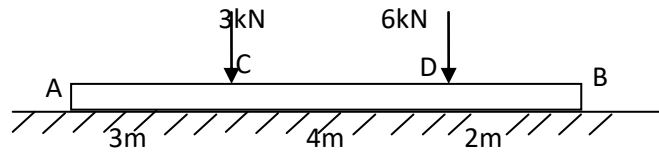
10 a) For the system of forces, determine the magnitude,direction of the resultant force about A. (5)

b) A force of 22N is acting in the direction of 9i+6j-2k through a point P(4,-1,7).Find the moment of the force about a point O(1,-3,2). (5)

11 a) Determine the angle between the vectors A = 4i-3j+k and B=2i-6j-3k. (4)

b) Determine the reactions of support at A and B.

(6)
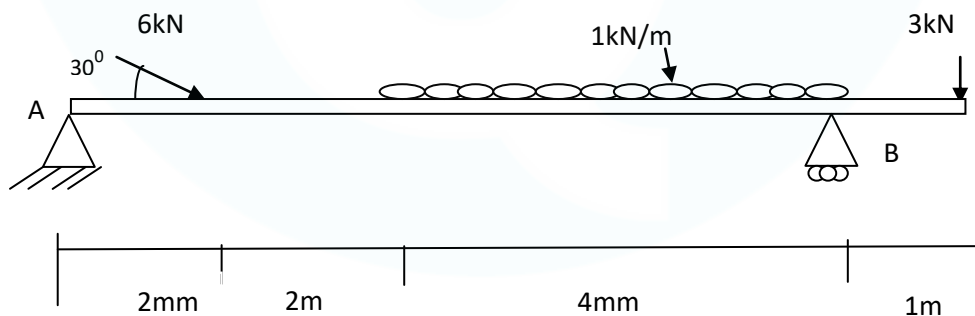
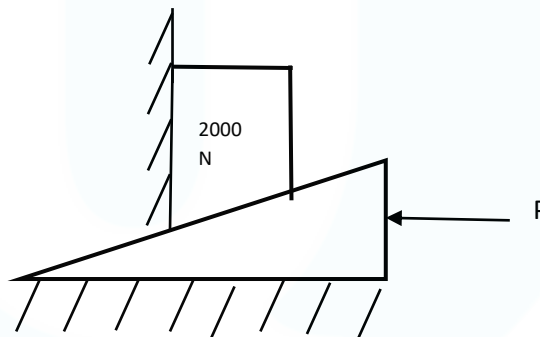
SET II
(ANSWER ANY 2 QUESTIONS : 2 X 10 = 20 MARKS)

12 A 4m long ladder, 180N in weight, is supported against a wall (which isperpendicular to the floor) with its foot on the floor. The coefficient of friction between wall and the ladder is 0.2 and that between floor and ladder is (10)

0.4.The ladder supports a weight of 900N at a distance of 1m along the ladder from its top. Compute the least value of the angle between the floor and the ladder for its equilibrium.

13 A semicircular area is removed from the trapezoid as in figure. Determine the centroid of remaining area. Also find the moment of inertia of the section about the horizontal centroidal axis.   (10)
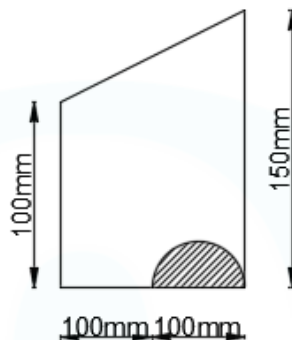
14 a) State Parallel axis Theorem.   (2)

b) A block weighing 2000N has to be raised by a 10^0 wedge.The block rests against a wall on one side. Assuming an angle of friction of 16^0 for all contact surfaces, determine the minimum value of P.   (8)

SET III
(ANSWER ANY 2 QUESTIONS : 2 X 10 = 20 MARKS

15 An elevator weights 2500 N and is moving vertically downwards with constant acceleration. Write the equation for the elevator cable tension. Starting from rest it travels a distance of 35 metres during an interval of 10 seconds. Find the cable tension during this time. Neglect all other resistances to motion. What are the limits of cable?   (10)

16 A body of mass 50 kgs is suspended by two springs of stiffness 4kN/m and 6 kN/m. The body is pulled 50 mm down from its equilibrium position and then released. Calculate the frequency of oscillation, maximum velocity and   (10)

maximum acceleration if i) springs are connected in series ii) springs are connected in parallel.

17 a) A body is moving with simple harmonic motion and has amplitude of 4.5 m and period of complete oscillation of 3.5s. Find the time required by the body in passing between two points which are at a distance of 3.5 m and 1.5 m from the centre and are on the same side. (5)

b) In a crank and connecting rod mechanism, the crank and connecting rod are 2.5m and 11.25 m respectively. The crank rotates at 420 rpm. Determine the velocity of the piston when the crank is at 40^0 with inner dead centre. (5)

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