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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

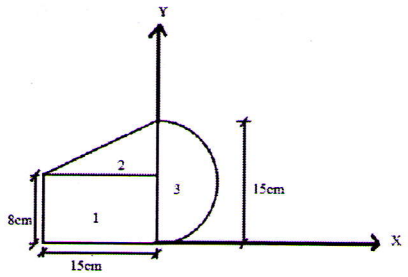
Course Code: BE 100

Course Name: ENGINEERING MECHANICS

Max. Marks: 100 Duration: 3 Hours

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

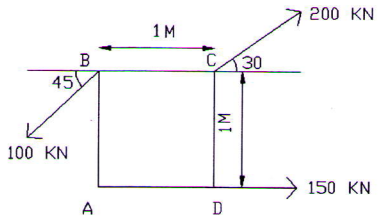
1		Define couple and explain its characteristics. With the help of a sketch, explain how a force can be resolved into a force and a couple.	(5)
2	a	State the principle of transmissibility of rigid bodies.	(3)
	b	A force F =3i-5j +7k acts at A(1,3,4).Determine the moment of force F about the origin of coordinate axes.	(2)
3		Explain the principle of Virtual Work. What are the forces that are not considered in applying the principle of Virtual Work.	(5)
4		Determine the centroid of the area shown in fig. about the given X-X &Y-Y axes.	(5)



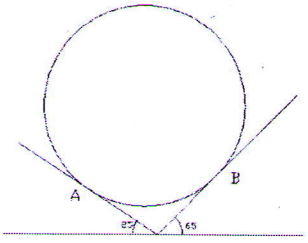
5		A particle moves with simple harmonic motion. When it is at 1m and 1.3 m from the centre of the path, its velocities are 3 m/s and 2 m/s respectively. Find the period of the simple harmonic motion and the acceleration.	(5)
6		Define instantaneous centre of rotation. A link AB is moving such that it is inclined at 40^0 to horizontal at A.The point A is moving horizontally with a velocity 8 m/sec towards right and point B is moving vertically upward. Locate the instantaneous centre and find the velocity of the end B of the link.	(5)
7		A lift has an upward acceleration of 1 m/s^2. What pressure will a man weighing 600 N exerts on the floor of the lift? What force would he exert if the lift had an acceleration of 1.0 m/s^2 downwards?	(5)
8		A simple pendulum gains 4 seconds per day. By how much the length of the pendulum be reduced to obtain the correct time.	(5)

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

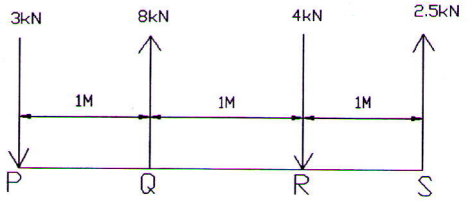
9 a) A system of three forces acting on a body is shown in fig.Determine the magnitude, direction and position of the resultant force with respect to A. (7)



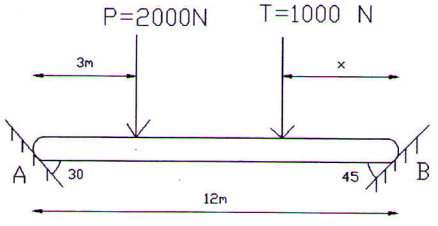
b) A smooth circular cylinder of weight 500 N rests in a V shaped groove whose sides are inclined at angles of 25 ° and 65 ° to the horizontal as shown.Find the reactions at the points of contact. (3)



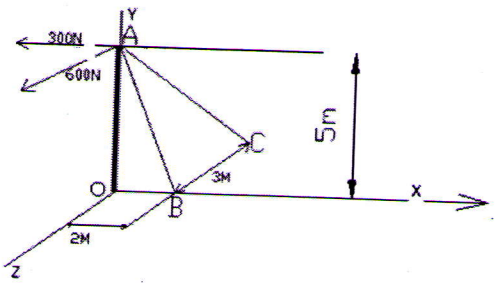
10 a) A body is acted on by a system of parallel forces as shown in fig. Determine i) the single equivalent force of the system ii) the equivalent force couple of the system at P. (3)



b) A 12m bar of negligible weight rests in a horizontal position on the smooth inclined surfaces as shown in the fig. Determine the distance 'x' at which load T=1000 N should be placed from point B to keep the bar horizontal. (7)



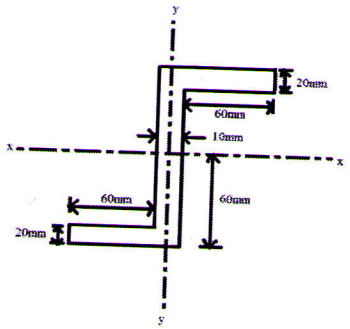
11 A pole AO is supported by a ball and socket joint at its base and by cables AB and AC. Also it is subjected to forces 300N towards the negative X direction and 600N towards the positive Z direction and the forces act in a plane parallel to XZ plane. Compute the forces in the cables and the reaction at the ball and socket joint. (10)



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

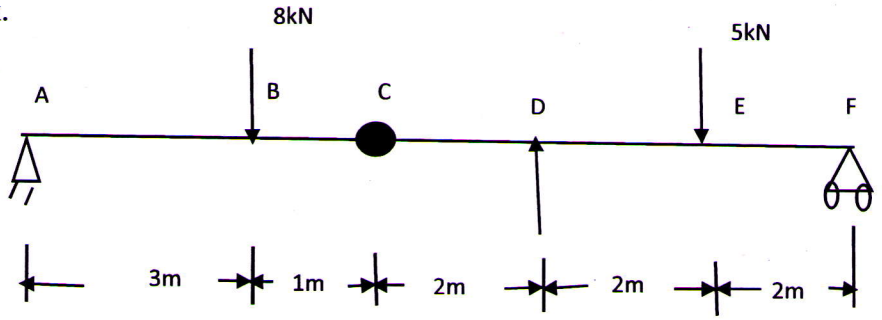
12 A ladder of length 5m and weight 300N is placed against a vertical wall with which it makes an angle of 45^0. The coefficient of friction between the floor and the ladder is 0.5 and that between the wall and the ladder is 0.4. In addition to its own weight, the ladder has to support a man of weight 500N at 1m from the top along the ladder. Determine the minimum inclination of the ladder with the horizontal so that there is no slipping. (10)

13 Determine the moment of inertia of the area shown in figure with respect to the centroidal axes x and y. (10)



14 a) Using first theorem of Pappus and Guldinus,find the surface area of a i) cylinder and ii) right circular cone. (5)

b) Find the reaction at D for the beam shown in figure using principle of virtual work. (5)



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

15 Two weights of 50 N and 10 N are connected by a weightless string which passes over a smooth pulley.The weight 10 N is resting on an inclined plane which makes an angle of 20° with horizontal and another weight 50 N hangs vertically downwards. Find the acceleration of the system, tension in the string and distance moved by the body in 3 seconds starting from rest. Take coefficient of friction as 0.2 for inclined plane and 'g' as 9.81 m/s^2. (10)

16 A particle with SHM,performs 10 complete oscillation per minute and its speed is 60 % of the maximum speed when it is at a distance of 8 cm from the centre of oscillation.Find the amplitude,maximum acceleration and also the speed of the particle when it is 6 cm far from the centre of oscillation. (10)

17 a) The bob of mass 1 kg of a simple pendulum of length 'L' metres rotates in a horizontal circular path of radius 0.25 m with uniform speed. Find the time for one complete rotation. (5)

b) Two bodies of different weights are connected to the two ends of a light inextensible spring which passed over a smooth pulley. If the acceleration of the system is 3 m/s^2 and bigger weight is 60 N, determine i) The smaller weight. ii)Tension in the string (Take g=9.8 m/s^2) (5)

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