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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

Course Code: BE100

Course Name: ENGINEERING MECHANICS

Max. Marks: 100 *(All figures in page 3)* Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

1		Explain the concept of free body diagram with examples?	(5)
2		Represent a force 100 N passing through the points (2,3,4) and (7,6,9) in vector form.	(5)
3		Define product of inertia and principle moment of inertia.	(5)
4		State and explain the principle of virtual work.	(5)
5		What is meant by dynamic equilibrium? Which principle governs a body under dynamic equilibrium?	(5)
6		A man weighing 60 kg entered a lift which moves up with an acceleration of 3 m/sec^2, find the force exerted by the man on the floor.	(5)
7		Distinguish between free and forced vibrations with examples.	(5)
8		In a place in space, a simple pendulum of length 2m has a period of oscillation of 3 sec. Determine the magnitude of gravitational acceleration.	(5)

PART B

Answer any 2 questions from each SET

SET 1

Each question carries 10 marks.

9	a)	Show that the resultant of forces is zero for the system of forces shown in Figure**1.**	(4)
	b)	Block P =0.5 kg and block Q of mass m kg are suspended through a chord, which is in equilibrium as shown in **Figure 2.** Determine the mass of block Q.	(6)
10	a)	State the conditions of equilibrium for a set of coplanar forces.	(3)
	b)	Determine the support reactions at A and B for the beam loaded as shown in **Figure 3.**	(7)
11	a)	What is meant by a system of forces in space? Explain how the equations of equilibrium are expressed while dealing with forces in space.	(3)
	b)	Determine the resultant of system of concurrent forces having the following magnitudes and passing through origin and the indicated points. F1=280 N (12, 6, -4), F2 = 520 N (-3, -4, 12) and F3 = 270 N (6, -3, -6)	(7)

SET II

Each question carries 10 marks.

12 a) For the shaded area shown in **Figure 4**, find the position of centroid. (7)

b) State the Theorems of Pappus and Guldinus. (3)

13 The cross-section of a plain concrete culvert is shown in **Figure 5**. Determine the moment of inertia about the centroidal axes. (All dimensions are in mm.) (10)

14 a) State the laws of dry friction. (3)

b) Two blocks A and B weighing 3 kN and 1 kN are connected by a wire passing over a smooth frictionless pulley as shown in **Figure 6**. Determine the magnitude of force P required to prevent movement of block A down the plane. Take coefficient of friction between the planes and blocks as 0.2. (7)

SET III

Each question carries 10 marks.

15 a) What is meant by instantaneous centre? Explain any one method of locating the instantaneous centre. (5)

b) In a simple reciprocating engine, the crank is 300 mm. radius and the connecting rod 1500 mm. long. If the crank rotates uniformly at 300 rpm, find the velocity of piston when the crank is inclined at 30^0 with the inner dead centre. (5)

16 Two rough planes inclined at 45^0 and 60^0 to horizontal are placed as shown in **Figure 7.** Two blocks of weights 60 N and 100 N respectively are placed on the faces and are connected by a string and passing over a frictionless pulley. If the coefficient of friction between planes and blocks is 0.35, find the resulting acceleration and tension in the string. (10)

17 a) A particle has simple harmonic motion. Its maximum velocity was 6 m/s and the maximum acceleration was found to be 12 m/s^2. Determine the angular velocity and amplitude. Also determine its velocity and acceleration when displacement is half of the amplitude. (5)

b) The strength of a spring is such that a load of 50 N is required to elongate it by 10 mm. When a certain load W is suspended from one end and caused to perform SHM, the complete oscillations per minute is 100. Calculate the stiffness of the spring and the value of load W. (5)

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FIGURES: - BE100 ENGINEERING MECHANICS

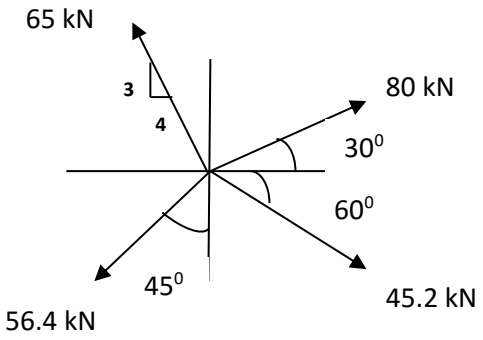

Figure 1

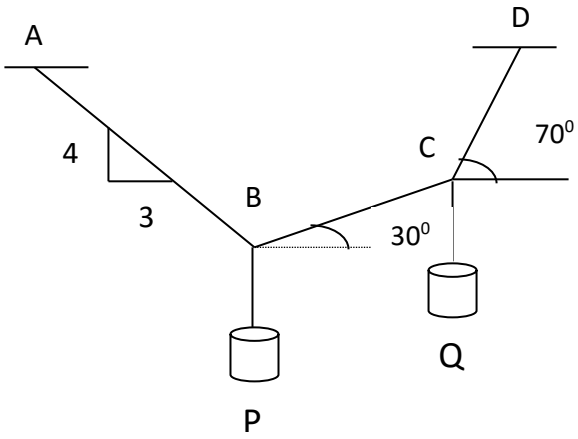

Figure 2

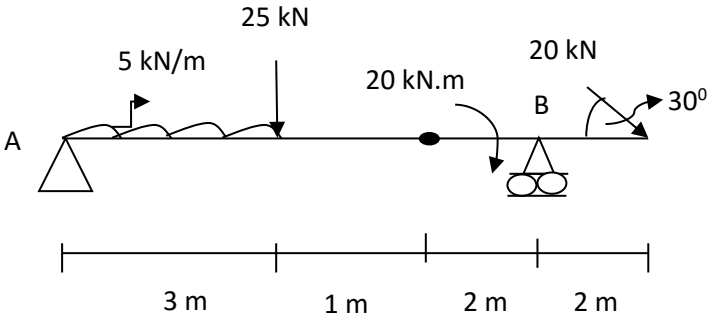

Figure 3

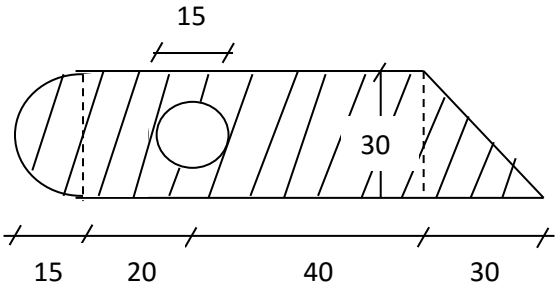

Figure 4

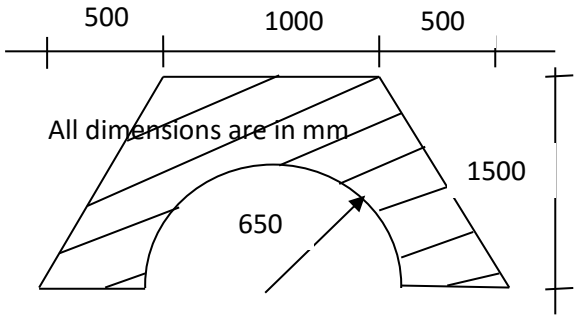

Figure 5

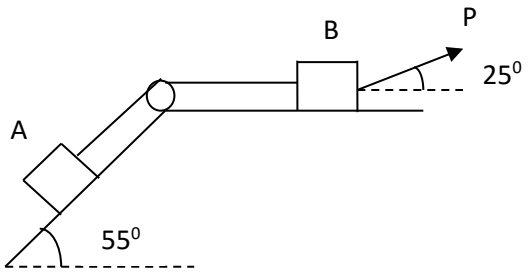

Figure 6

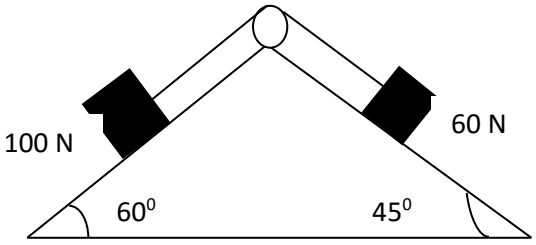

Figure 7