Reg. No. | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Second Semester

ME18201 – ENGINEERING MECHANICS

(Mechanical Engineering)

(Regulation 2018/2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Students will understand and analyze the forces acting on particles in three dimensions.	3
CO 2	Students will be able to determine the forces and moments on rigid bodies in three dimensions.	3
CO 3	Students will evaluate centroid, Area moment of Inertia and Mass moment of Inertia of cross section of any structural member.	3
CO 4	Students will correlate the engineering problems dealing with force, displacement, velocity, and acceleration equations.	4
CO 5	Students will evaluate the problems in friction and rigid body dynamics.	4

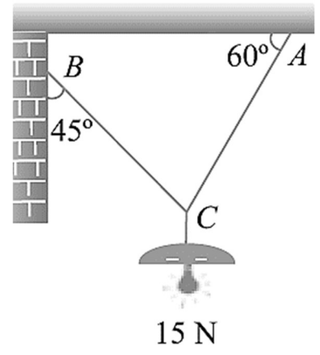
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	State Lami's Theorem.	**1**	**1**
2.	Define the term (a) Coplanar, (b) Non-Coplanar forces, (c) Concurrent forces and (d) Non-Concurrent forces.	**1**	**1**
3.	A horizontal bar AB of 7 m long has been supported at its ends and has a vertical force of 6 kN at the centre and 7 kN acts 5 m from the left end. Find the reactions at A and B.	**2**	**2**
4.	How does the distance between the point of application of a force and the axis of rotation affect the moment of the force?	**2**	**2**
5.	How do you calculate the centroid by integration method?	**3**	**1**
6.	State Pappus Guldinus theorems.	**3**	**2**
7.	A ball was projected upwards with a velocity of 10 m/s. Determine the maximum height that the ball can attain, and the time taken.	**4**	**1**
8.	What is the difference between speed and velocity?	**4**	**1**
9.	State D'Alembert's principle.	**5**	**1**
10.	Define coefficient of restitution.	**5**	**2**

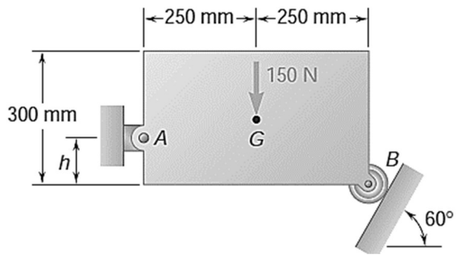
PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	An electric light fixture weighing 15 N hangs from a point C, by two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal as shown in Figure. Determine the forces in the strings AC and BC.	**(14)**	**1**	**3**



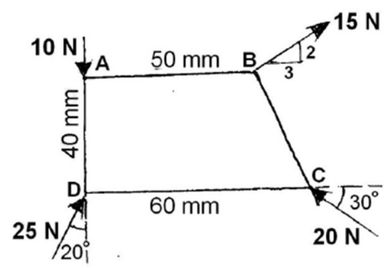
(OR)

(b)	Four Forces 32 kN, 24 kN, 24 kN and 120 kN are concurrent at origin and are respectively directed through the points whose coordinates are A (2, 1, 6); B (4, -2, 5); C (-3, -2, 1) and D (5, 1, -2). Determine the magnitude of the resultant and the angles it makes with coordinate axes.	**(14)**	**1**	**3**
12. (a)	Determine the reactions at A and B when h = 200 mm for the figure shown below.	**(14)**	**2**	**3**

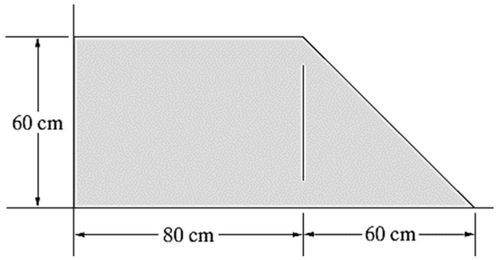


(OR)

(b)	Replace the given system of forces acting on a plate ABCD shown in Figure by a force couple system acting at point A.	**(14)**	**2**	**3**

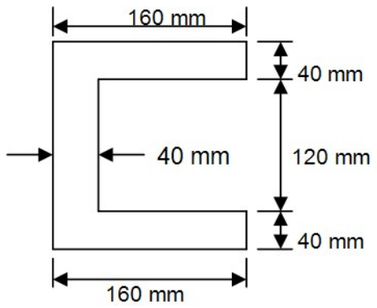


13. (a)	Determine the centroid of the area shown in figure.	**(14)**	**3**	**3**



(OR)

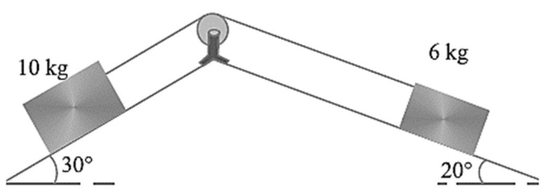
(b)	Identify the moment of Inertia about the centroidal axes of the section shown in figure below.	**(14)**	**3**	**3**



14. (a)	A particle, starting from rest, moves in a straight line, whose acceleration is given by the equation: $a = 10 - 0.006\ s^2$ where (a) is acceleration in m/s^2 and (s) is distance in m. Determine (i) velocity of the particle, when it has travelled 50 m. (ii) distance travelled by the particle, when it comes to rest.	**(14)**	**4**	**3**

(OR)

(b)	Two smooth inclined planes whose inclinations with the horizontal are 30º and 20º are placed in an inclined plane. Two bodies of mass 10 kg and 6 kg are placed on them and are connected by a light inextensible string passing over a smooth pulley as shown in Figure. Find the tension in the string. Take $g = 9.8\ m/s^2$.	**(14)**	**4**	**3**

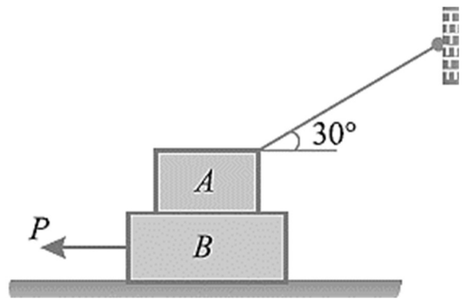


15. (a)	A ladder 5 m long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at point of sliding, when a man	**(14)**	**5**	**3**

weighing 750 N stands at 1.5 m from the bottom of the ladder. Identify the co-efficient of friction between the ladder and the floor.

(OR)

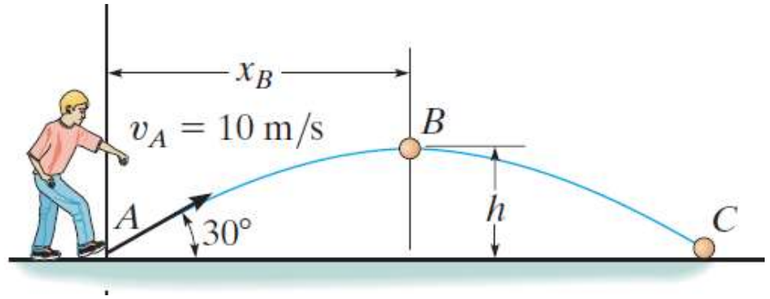
(b)	Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in Figure. If the coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force (P) required to move the block B.	**(14)**	**5**	**3**



PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	A ball is kicked from point A with an initial velocity of 10 m/s. Assuming no air resistance, what is the range R of the ball, and what is the speed of the ball when it strikes the ground? Show your work and clearly state any assumptions made in your calculations. How would your answers changes if air resistance were considered?	**(10)**	**4**	**4**



****