Q. Code:533178

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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Second Semester

ME18201 – ENGINEERING MECHANICS

(Common to ME and MR branches)

(Regulation 2018/2018A)

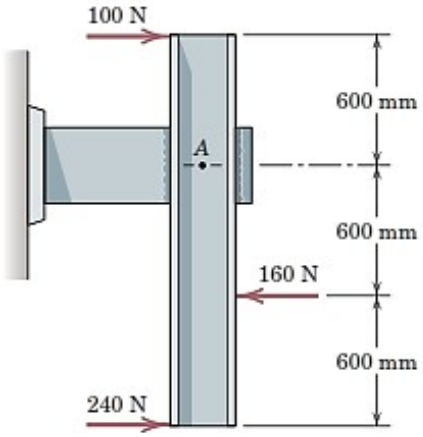
TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Students will understand and analyze the forces acting on particles in 3 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.	3
CO 5	Students will evaluate the problems in friction and rigid body dynamics.	3

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Find the magnitude of the resultant of the two concurrent forces of magnitude 60 kN and 40 kN with an included angle of 90° between them.	**1**	**2**
2.	Define the term equilibrium and equilibrant?	**1**	**2**
3.	Define the term couple.	**2**	**2**
4.	Determine Moment at Point A for the figure shown for all forces.	**2**	**2**

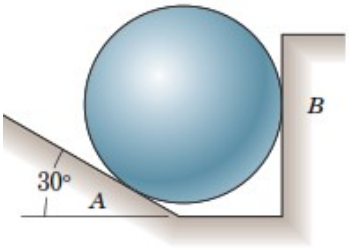


5.	Write the equation to identify the centroid for a composite figure.	**3**	**2**
6.	Explain about perpendicular axis theorem.	**3**	**2**
7.	A train running at 90 km/h is brought to a standing halt after 30 seconds. Find the retardation and the distance traveled by the train before it comes to a halt.	**4**	**2**
8.	Write the work-energy equation?	**4**	**2**

9.	Draw the free body diagram of a ladder of weight W, leaning against a smooth wall and rough floor.	**5**	**2**	
10.	Define the term cone of friction.	**5**	**2**	

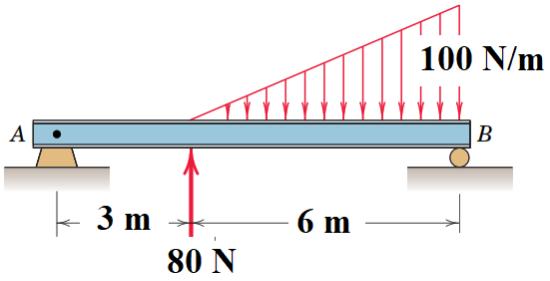
PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	The 50-kg homogeneous smooth sphere rests on the 30° incline A and bears against the smooth vertical wall B. Calculate the contact forces at A and B.	**(14)**	**1**	**3**



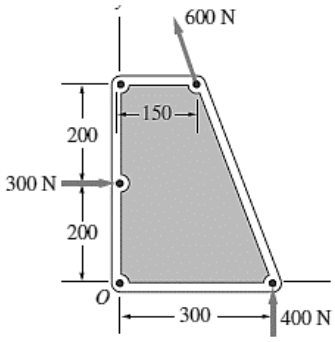
(OR)

(b)	A force F of magnitude 210 N acts at the origin of a coordinate system. Knowing that Fx = 80 N, Fz = 151.2°, and Fy > 0, determine (a) the components Fy and Fz, (b) the angles θx and θy.	**(14)**	**1**	**3**
12. (a)	Calculate the support reactions at A and B for the loaded beam.	**(14)**	**2**	**3**

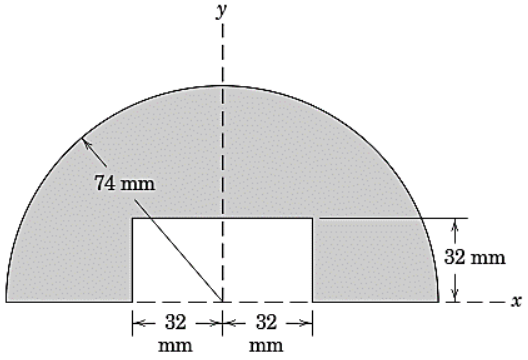


(OR)

(b)	Replace the three forces with an equivalent force-couple system, with the force acting at O. Consider the 600 N force is inclined at 70° with respect to horizontal.	**(14)**	**2**	**3**

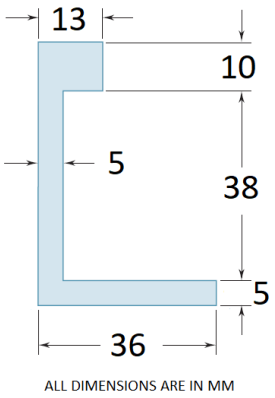


13. (a) Determine the centroid for the figure shown. **(14) 3 3**

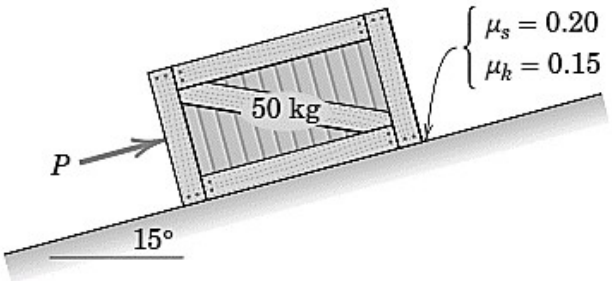


(OR)

(b) Determine the moment of Inertia with respect to x axis for the figure shown. **(14) 3 3**



14. (a) The 50-kg crate is stationary when force P is applied. Determine the resulting acceleration of the crate if (a) P = 0, (b) P = 150 N, and (c) P = 300 N. **(14) 4 3**

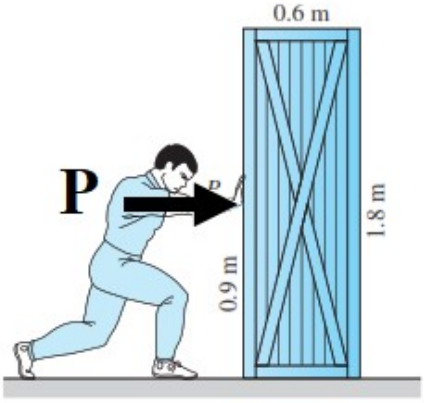


(OR)

(b) The motion of a particle is given by $a = t^3 - 3t^2 + 5$, where (a) is the acceleration in m/s^2 and (t) is the time in seconds. The velocity of the particle at t = 1 second is 6.25 m/s and the displacement is 8.8 m. Identify the displacement and velocity at t = 2 seconds. **(14) 4 3**

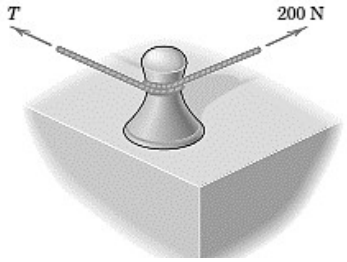
15. (a) The man in Figure is trying to move a packing crate across the floor by applying a horizontal force P. The center of gravity of the 250-N crate is located at its geometric center. Does the crate move if P = 60 N? The **(14) 5 3**

coefficient of static friction between the crate and the floor is 0.3



(OR)

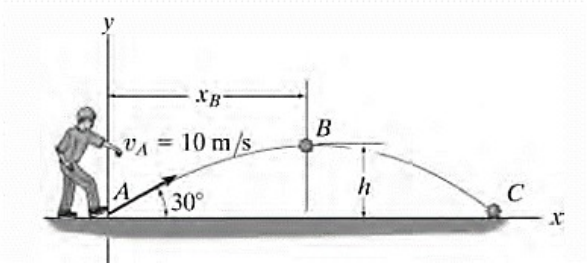
(b)	A dockworker adjusts a spring line (rope) which keeps a ship from drifting alongside a wharf. If he exerts a pull of 200 N on the rope, which has 1.25 turns around the mooring bit, what force T can he support? The coefficient of friction between the rope and the cast-steel mooring bit is 0.30	**(14)**	**5**	**3**



PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	The ball is kicked from point A with the initial velocity 10 m/s. Determine the range R, and the speed when the ball strikes the ground.	**(10)**	**4**	**5**



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