BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

SEMESTER : II
SESSION : SP/2024

CLASS: BTECH/IMSC
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE/FT/PHYSICS

SUBJECT: ME101 BASICS OF MECHANICAL ENGINEERING

FULL MARKS: 25

TIME: 02 Hours

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL
Q.1	Determine the moment of the force F = 2i + 3j - k N acting through the point (3, 1, 1) about the line passing from (2, 5, -2) through (3, -1, 1). The coordinates are in meters.	[5]	1	3
Q.2	Find the second moment of area of a T section as shown in Fig 1 about the centroidal axes XX and YY.	[5]	1	3

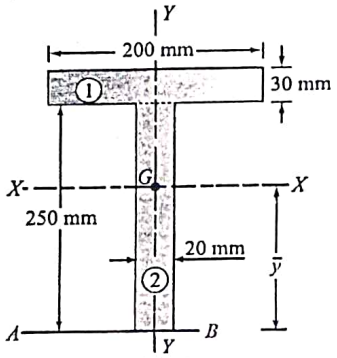

Fig 1

Q.3	The curvilinear plane motion of a particle, in a cartesian coordinate system, is defined by $v_x = 50 - 16t$ and $y = 100 - 4t^2$, where v_x is in meters per second, y is in meters, and t is in seconds. It is also known that $x = 0$ when $t = 0$. Determine its velocity and acceleration when the position $y = 0$ is reached.	[5]	2	3
Q.4	An elevator cage of a mine shaft weighing 8 kN, when empty, is lifted or lowered by means of a wire rope. Once a man weighting 600 N, entered it and lowered with uniform acceleration such that when a distance of 187.5 m was covered, the velocity of the cage was 25 m/s. Determine the tension in the rope and the force exerted by the man on the floor of the cage.	[5]	2	3
Q.5	Block A weighing 1000 N rests over block B which weighs 2000 N as shown in Fig 2. Block A is tied to a wall with a horizontal string. If the coefficient of friction between A and B is 1/4 and between B and the floor is 1/3, what would be the value of P to move the block B if P is horizontal?	[5]	3	3

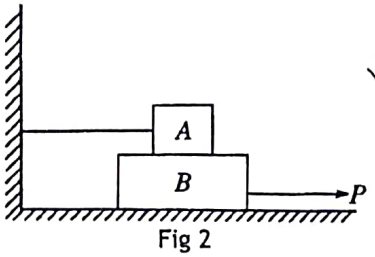

Fig 2

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