

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Third Semester)

Branch – MATHEMATICS

MECHANICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	What is the condition for two couples to be in equilibrium? a) Opposite direction, equal magnitude b) Same direction, unequal magnitude c) Equal magnitude, same line d) Opposite direction, same line	K1	CO1
	2	What is the name of the force when two parallel forces act in the same direction? a) Unlike b) Like c) Colinear d) Coplanar	K2	CO1
2	3	What is the resultant force when two parallel forces act on a body? a) A couple b) Zero c) The sum of the forces d) The difference between the forces	K1	CO2
	4	When $\theta = 0$, in which direction is the displacement relative to the force? a) No displacement b) Opposite c) Perpendicular d) Same direction	K2	CO2
3	5	Which quantity is scalar? a) Speed b) Velocity c) Acceleration d) Displacement	K1	CO3
	6	What does the parallelogram law to find? a) Velocity of a particle b) Resultants of two forces c) Displacement of a body d) Acceleration of a body	K2	CO3
4	7	What is momentum? a) mF b) mg c) mV d) F	K1	CO4
	8	What is the formula for Kinetic Energy? a) mv^2 b) $m + v^2$ c) $\frac{1}{2}mv$ d) $\frac{1}{2}mv^2$	K2	CO4
5	9	What is the moment of inertia of a point mass m at a perpendicular distance r ? a) mr^2 b) mr c) mr^3 d) m^2r	K1	CO5
	10	What is a trajectory? a) The direction of a force b) The path followed by a moving particle c) Time taken by a particle d) The speed of a moving particle	K2	CO5

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SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Find the resultant of two like parallel forces acting on a rigid body.	K2	CO1
		(OR)		
	11.b.	Determine the condition for equilibrium when two couples act on a rigid body.		
2	12.a.	Prove that the algebraic sum of the works done by a number of coplanar forces acting on a particle in any displacement of the particle is equal to the work done by their resultant.	K2	CO2
		(OR)		
	12.b.	Determination of Centroid of a Uniform Parallelogram Lamina.		
3	13.a.	A particle has two simultaneous velocities of equal magnitudes in two directions. If one of them is halved in magnitude, the angle which the resultant velocity makes with the other is halved also. Find the angle between the directions.	K2	CO3
		(OR)		
	13.b.	Two particles are describing concentric circles of radii a and a_1 with angular velocities ω, ω' respectively in the same direction. Prove that the angular velocity of the line joining them when its length is R , is $\frac{(R^2 + a^2 - a_1'^2)\omega + (R^2 - a^2 + a_1'^2)\omega'}{2R^2}$.		
4	14.a.	Explain about Newton's second law of motion.	K3	CO4
		(OR)		
	14.b.	Calculate the work done in sliding a block weight of 22kg. up a plane inclined at 30° to the horizontal through a distance of 15m against a frictional force of 30N.		
5	15.a.	If v_1 and v_2 be the velocities of a projectile at the ends of a focal chord of its path and U is the velocity at the vertex prove that $v_1^{-2} + v_2^{-2} = U^{-2}$.	K2	CO5
		(OR)		
	15.b.	How to derive moments of inertia of a rectangular lamina?		

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	State and prove Varignon's theorem of moments.	K2	CO1
2	17	Explain and prove the principle of virtual work for a system of forces in a single plane acting on a body.	K2	CO2
3	18	State and prove the Triangle of Velocities Theorem.	K2	CO3
4	19	A system of particles is raised from one position to another such that their centre of gravity is raised by a vertical distance h . If the total weight of the particles is W , prove that the work done in raising the particles is given by Wh .	K3	CO4
5	20	Show that the path of a projectile is a parabola.	K2	CO5

Z-Z-Z

END