

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2024
(Second Semester)

Branch - PHYSICS

MECHANICS AND FLUID DYNAMICS

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	A conservative force F is ----- (Where U is the potential energy) a. grad U b. -grad U c. U d. grad U ²	K1	CO1
	2	The total linear momentum of the system of the particles about the centre of mass is ---- a. zero b. infinity c. not equal to zero d. none of them	K2	CO2
2	3	If l is the length of the compound pendulum, then the length of an equivalent simple pendulum L is --- a. k^2+l^2 b. $(k^2+l^2)/2$ c. $(k^2+l^2)/l$ d. $(k+l)/l$	K1	CO1
	4	The kinetic energy of rotation of the body about its axis through its centre of mass is --- a. $I\omega$ b. $I\omega^2$ c. $I\omega/2$ d. $I\omega^2/2$	K2	CO2
3	5	Statement I: A body may not have a Centre of Gravity Statement II: A body must have a Centre of Mass a. Both statements I and II correct b. Statement I alone is correct c. Statement II alone is correct d. Statements I and II not correct	K1	CO1
	6	A solid hemisphere of radius is r, then the CG of the solid hemisphere is on its axis at a distance of ----- from the centre. a. $(3/8)r$ b. $(1/2)r$ c. $(8/3)r$ d. $(1/8)r$	K2	CO2
4	7	Thrust = ----- a. Pressure b. Pressure/area c. Pressure*area d. Pressure*length	K1	CO1
	8	A ship is of 20000 tons , a load of 30 tons moved 50 m across the deck makes the ship tilt through $(3/4)^\circ$. Its metacentric height is --- a. 0.579 m b. 5.79 m c. 57.9 m d. 1 m	K2	CO2
5	9	A liquid is in motion, they possesses--- a. Potential energy b. Kinetic energy c. Pressure energy d. Potential, kinetic and pressure energy	K1	CO1

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	10	When a liquid flowing through a horizontal pipe, Bernouli's theorem state that ---- a. Static pressure is constant b. Dynamic pressure is constant c. Static+dynamic pressure is constant d. Static+ dynamic pressure is not constant	K2	CO2
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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.	Show that $\vec{F} = (y^2 - x^2)\hat{i} + 2xy\hat{j}$ is a conservative force and also calculate the work done on a particle moving from the position (0,1,2) to (5,6,8)	K3	CO4
	(OR)			
	11.b.	State the principle of conservation of (i) linear momentum and (ii) angular momentum		
2	12.a.	Define centres of suspension and oscillation of a compound pendulum and show that they are interchangeable.	K3	CO4
	(OR)			
	12.b.	Calculate the moment of inertia of a solid cylinder about its axis of cylindrical symmetry.		
3	13.a.	State (i) parallelogram law of forces and (ii) triangular law of forces.	K2	CO3
	(OR)			
	13.b.	Explain (i) angle of friction and (ii) cone of friction.		
4	14.a.	State the laws of floatation. Write a note on stability of floating bodies.	K4	CO3
	(OR)			
	14.b.	Determine the centre of pressure of rectangular lamina immersed vertically in a liquid with one edge in the surface of the liquid.		
5	15.a.	Obtain the equation of continuity for an incompressible liquid.	K4	CO2
	(OR)			
	15.b.	State and Prove Bernoulli's theorem.		

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	What is a rocket? Describe the theory and principle of a rocket.	K4	CO2
2	17	Obtain an expression for time period of the compound pendulum and hence find the acceleration due to gravity.	K5	CO3
3	18	Determine the CG of a thin hollow and solid hemisphere.	K5	CO4
4	19	Define metacenter and metacentric height. Determine the metacentric height of a ship.	K4	CO2
5	20	Apply Lagrange's equation to the Atwood's machine to find the acceleration of the system.	K6	CO5