25MCU205 / 23MCU205

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Second Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

ANALYTICAL GEOMETRY OF 3D & VECTOR CALCULUS

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	The angle between two planes is the angle between a) Their intercepts b) Their normals c) Their distances from origin d) Their midpoints	K2	CO1
	2	The equation of a plane passing through points A,B, C is obtained using a) Distance formula b) Determinant form c) Slope formula d) Midpoint formula	K2	CO1
2	3	The equation of the line passing through points $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$ is _____. a) $\frac{x-x_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1}$ b) $x = x_1 + x_2$ c) $y = y_1 + y_2$ d) $z = z_1 + z_2$	K2	CO1
	4	The symmetric form of the equation of a line passing through point (x_1, y_1, z_1) with direction ratios a, b, c is _____. a) $\frac{x-x_1}{a} = \frac{y-y_1}{b} = \frac{z-z_1}{c}$ b) $\frac{x+x_1}{a} = \frac{y+y_1}{b} = \frac{z+z_1}{c}$ c) $x = x_1 + at$ d) $y = y_1 + at$	K2	CO2
3	5	The plane section of a sphere is always a _____. a) Parabola b) Ellipse c) Circle d) Hyperbola	K2	CO1
	6	The equation of the tangent plane to the sphere $x^2 + y^2 + z^2 = a^2$ at the point (x_1, y_1, z_1) is _____. a) $xx_1 + yy_1 + zz_1 = a^2$ b) $x^2 + y^2 + z^2 = a^2$ c) $x_1 + y_1 + z_1 = 0$ d) $x_1^2 + y_1^2 + z_1^2 = a^2$	K2	CO2
4	7	Green's Theorem relates a line integral around a closed curve to a _____. a) Surface integral b) Volume integral c) Double integral over a region d) Triple integral	K2	CO1
	8	In Green's Theorem, the positive orientation of a simple closed curve is _____. a) Clockwise b) Vertical c) Anti-clockwise d) Arbitrary	K2	CO2
5	9	The Divergence Theorem converts a) Surface integral of flux into a volume integral b) Line integral into surface integral c) Volume integral into line integral d) Double integral into surface integral	K2	CO1
	10	Stokes' Theorem is a special case of a) Green's Theorem b) The Divergence Theorem c) The Fundamental Theorem of Calculus d) Gauss' Theorem	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.	Find the equation of the plane passing through the points $(3,1,2), (3,4,4)$ and perpendicular to the plane $5x + y + 4z = 0$.	K3	CO3
		(OR)		
	11.b.	Find the distance between the parallel planes $2x - 2y - z + 3 = 0$ and $4x - 4y + 2z + 5 = 0$.		
2	12.a.	Find the perpendicular distance from $P(3,9,-1)$ to the line $\frac{x+8}{-8} = \frac{y-31}{1} = \frac{z-13}{5}$.	K3	CO3
		(OR)		
	12.b.	If 'l' is the line $\frac{x}{-1} = \frac{y-1}{2} = \frac{z+2}{1}$, find the equation of the plane through 'l' which is parallel to the line of intersection of the planes $5x + 2y + 3z = 4$ and $x - y + 5z + 6 = 0$.		
3	13.a.	Find the equation to the sphere through the four points $(2,3,1), (5,-1,2), (4,3,-1)$ and $(2,5,3)$.	K4	CO4
		(OR)		
	13.b.	Show that the plane $2x - y - 2z = 16$ touches the sphere $x^2 + y^2 + z^2 - 4x + 2y + 2z - 3 = 0$ and find the point of contact.		
4	14.a.	Evaluate $\int_C y^2dx + xdy$, where $C = C_1$ is the line segment from $(-5,-3)$ to $(0,2)$.	K4	CO4
		(OR)		
	14.b.	Evaluate $\oint_C (3y - e^{\sin x})dx + (7x + \sqrt{y^4 + 1})dy$, where C is the circle $x^2 + y^2 = 9$.		
5	15.a.	Evaluate $\iint_S ydS$, where S is the surface $z = x + y^2, 0 \le x \le 1, 0 \le y \le 2$.	K4	CO4
		(OR)		
	15.b.	Evaluate $\int_C F \cdot dr$, where $F(x,y,z) = -y^2i + xj + z^2k$ and C is the curve of intersection of the plane $y + z = 2$ and the cylinder $x^2 + y^2 = 1$.		

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	Find the equation of the plane passing through the points $(2,-5,-3), (-2,-3,5)$ and $(5,3,-3)$.	K3	CO3
2	17	Prove that the lines $\frac{x+1}{-3} = \frac{y+10}{8} = \frac{z-1}{2}; \frac{x+3}{-4} = \frac{y+1}{7} = \frac{z-4}{1}$ are coplanar. Find also their point of intersection and the plane through them.	K3	CO3
3	18	Find the equation of the sphere which passes through the circle $x^2 + y^2 + z^2 - 2x - 4y = 0, x + 2y + 3z = 8$ and touches the plane $4x + 3y = 25$.	K3	CO3
4	19	Evaluate $\oint_C y^2dx + 3xydy$, where C is the boundary of the semiannular region D in the upper half-plane between the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.	K4	CO4
5	20	Find the surface area of a sphere of radius a.	K4	CO4

Z-Z-Z END