PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(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 length of the perpendicular from the point (4,3,0) to the plane $2x + 3y + \sqrt{3}z + 3 = 0$ is _____. (a) $\frac{1}{4}$ (b) 5 (c) $\frac{3}{4}$ (d) $\frac{1}{5}$	K1	CO1
	2	Compare and find the angle between the planes $2x - y + z = 6$ & $x + y + 2z = 3$ from the following: (a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$	K2	CO1
2	3	The shortest distance between the two lines $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and $\frac{x}{-1} = \frac{y}{-4} = \frac{z}{7}$ is _____. (a)$\sqrt{5}$ (b) $\frac{1}{\sqrt{5}}$ (c)0 (d) 1	K1	CO2
	4	The straight lines in space which are not coplanar are called_____. (a) parallel lines (b) skew lines (c) perpendicular lines (d) intersecting lines	K2	CO2
3	5	The equation of the tangent plane at (0,0,1) to the sphere $x^2 + y^2 + z^2 = 1$ is_____. (a) $x = 0$ (b) $y = 0$ (c) $z = 1$ (d) $x + y + z = 1$	K1	CO3
	6	The plane section of a sphere is _____ (a) a straight line (b) a plane (c) a circle (d) a sphere	K2	CO3
4	7	If $\mathbf{f} = x^2\mathbf{i} - xy\mathbf{j}$ and C is the straight line joining the points (0,0) and (1,1) then $\int_C \mathbf{r}.d\mathbf{r}$ is _____. (a) 1 (b) 0 (c) -1 (d) 2	K1	CO4
	8	Infer and find the value of div curl f. (a) 0 (b) 1 (c) -1 (d) f	K2	CO4
5	9	Stoke's theorem connects _____. (a) line integral and double integral (b) line integral and surface integral (c) double integral and surface integral (d) surface integral and volume integral	K1	CO5
	10	The integral $\int_c F.dr = \iint_s Curl\ F.ds$ is called_____. (a) Surface integral (b) Green's theorem (c) Stokes theorem (d) divergence theorem	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.	Infer and find the equation of the plane through the point (1,-2,3) and the intersection of the planes $2x - y + 4z = 7$ & $x + 2y - 3z + 8 = 0$.	K2	CO1
		(OR)		
	11.b.	Find the equation of the plane which passes through the point (-1,3,2) and perpendicular to the two planes $x + 2y + 2z = 5$ & $3x + 3y + 2z = 8$.		
2	12.a.	Infer and find the perpendicular distance from $P(3,9,-1)$ to the line $\frac{x+8}{-8} = \frac{y-31}{1} = \frac{z-13}{5}$.	K2	CO2
		(OR)		
	12.b.	Show that the shortest distance between the lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}$; $\frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$ is $\sqrt{35}$.		
3	13.a.	Infer and find the radius and centre of the sphere $2x^2 + 2y^2 + 2z^2 - 2x + 4y + 2z = 15$.	K2	CO3
		(OR)		
	13.b.	Interpret and find the equation of the sphere which has its centre at the point (6,-1,2) and touches the plane 2x-y+2z-2=0.		
4	14.a.	Evaluate $\oint_C (3y - e^{\sin x})\,dx + (7x + \sqrt{y^4 + 1})dy$, where C is the circle $x^2 + y^2 = 9$.	K3	CO4
		(OR)		
	14.b.	Evaluate $\int_C (2 + x^2 y)\,ds$, where C is the upper half of the unit circle $x^2 + y^2 = 1$.		
5	15.a.	Analyze the flux of the vector field $\boldsymbol{F}(x,y,z) = z\boldsymbol{i} + y\boldsymbol{j} + x\boldsymbol{k}$ across the unit sphere $x^2 + y^2 + z^2 = 1$.	K4	CO5
		(OR)		
	15.b.	Examine a parametric representation for the cylinder $x^2 + y^2 = 4, 0 \le z \le 1$.		

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	Infer and find the equation of the plane passing through the points (2,-5,-3),(-2,-3,5) and (5,3,-3).	K2	CO1
2	17	Show 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.	K2	CO2
3	18	Infer and 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.	K2	CO3
4	19	If $\boldsymbol{F}(x,y,z) = y^2\boldsymbol{i} + (2xy + e^{3z})\boldsymbol{j} + 3ye^{3z}\boldsymbol{k}$, find a function f such that $\nabla f = \boldsymbol{F}$.	K3	CO4
5	20	Evaluate the tangent plane to the surface with parametric equations $x = u^2, y = v^2, z = u + 2v$ at the point (1,1,3).	K4	CO5

Z-Z-Z END