25MAU102 / 22MAU102N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch – **MATHEMATICS**

ANALYTICAL GEOMETRY OF 3D AND TRIGONOMETRY

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	Equation of a straight line passing through two given points $(x_1, y_1, z_1), (x_2, y_2, z_2)$ 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) $\frac{x+x_2}{x_2+x_1} = \frac{y+y_2}{y_2+y_1} = \frac{z+z_2}{z_2+z_1}$ c) $\frac{x-x_1}{x_1-x_2} = \frac{y-y_1}{y_1-y_2} = \frac{z-z_1}{z_1-z_2}$ d) $\frac{x-x_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1}$	K1	CO1
	2	Angle between the plane $ax + by + cz + d = 0$ and the line $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$, is $sin\theta =$ _____ a) $\frac{al-bm-cn}{\sqrt{(a^2+b^2+c^2)+\sqrt{l^2+m^2+n^2}}}$ b) $\frac{al+bm+cn}{\sqrt{(a^2+b^2+c^2).\sqrt{l^2+m^2+n^2}}}$ c) $\frac{al+bm+cn}{\sqrt{(a^2+b^2+c^2)-\sqrt{l^2+m^2+n^2}}}$ d) $\frac{al.bm.cn}{\sqrt{(a^2+b^2+c^2).\sqrt{l^2+m^2+n^2}}}$	K2	CO1
2	3	A _____ is the locus of a point which moves in such a way that its distance from a fixed point is always constant. a) sphere b) cone c) centre d) radius	K1	CO2
	4	Intersection of two spheres is a _____ a) cone b) centre c) circle d) sphere	K2	CO2
3	5	_____ is a surface generated by a line which passes through a fixed point and makes a constant angle with the fixed line through the fixed point a) vertical angle b)constant angle c) cylinder d) a right circular cone	K1	CO3
	6	The general equation of the cone which touches the coordinate planes is _____ a) $\sqrt{fx} - \sqrt{gy} - \sqrt{hx} = 0$ b) $\sqrt{fz} + \sqrt{gx} + \sqrt{hy} = 0$ c) $\sqrt{fx} + \sqrt{gy} + \sqrt{hx} = 0$ d) $\sqrt{fz} - \sqrt{gx} - \sqrt{hy} = 0$	K2	CO3
4	7	_____ is a surface generated by a straight lie which is always parallel to a fixed line. a) A cone b) A cylinder c) A sphere d) A central quadrics	K1	CO4
	8	The equation of any tangent plane to the conicoid $ax^2 + by^2 + cz^2 = 1$ is of the form_____ a) $lx + my + nz = \pm\left(\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c}\right)^{1/3}$ b) $lx - my - nz = \pm\left(\frac{l^2}{a} - \frac{m^2}{b} - \frac{n^2}{c}\right)^{1/2}$ c) $lx + my + nz = \pm\left(\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c}\right)^{1/2}$ d) $lx - my - nz = \pm\left(\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c}\right)^{1/2}$	K2	CO4
5	9	$(\cos n\theta + i \sin n\theta)$= _____ a) $(cos\theta + isin\theta)^n$ b) $(cos\theta - isin\theta)^n$ c) $(cos\theta + isin\theta)^{-n}$ d) $(cos\theta - isin\theta)^{-n}$	K1	CO5

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	10	$\tan\theta =$ a) $\theta + \frac{\theta^3}{3} - \frac{2\theta^5}{15}$ b) $\theta - \frac{\theta^3}{3} + \frac{2\theta^5}{15}$ c) $\theta + \frac{\theta^3}{3} + \frac{2\theta^5}{15}$ d) $\theta + \frac{\theta^3}{3} + \frac{2\theta^5}{15}$ upto θ^5	K2	CO5

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 point where the line $\frac{x-2}{2} = \frac{y-4}{-3} = \frac{z+6}{4}$ meets the plane $2x + 4y - z - 2 = 0$.	K2	CO1
		(OR)		
	11.b.	Find the shortest distance between the lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}; \frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$.		
2	12.a.	Find the coordinates of the centre and radius of the sphere $2x^2 + 2y^2 + 2z^2 - 2x + 4y + 2z - 15 = 0$.	K2	CO2
		(OR)		
	12.b.	Find the equation of the sphere having the circle $x^2 + y^2 + z^2 - 2x + 4y - 6z + 7 = 0,\ 2x - y + 2z = 5$ for a great circle.		
3	13.a.	Show that the equation of a right circular cone whose vertex is O, axis OZ and semi-veritical angle α is $x^2 + y^2 = z^2 tan^2\alpha$	K3	CO3
		(OR)		
	13.b.	Find the equation of the tangent planes to the cone $9x^2 - 4y^2 + 16z^2 = 0$ which contain the line $\frac{x}{32} = \frac{y}{72} = \frac{z}{27}$.		
4	14.a.	Find the equation of a right circular cylinder of radius 3 with axis $\frac{x+2}{3} = \frac{y-4}{6} = \frac{z-1}{2}$	K3	CO4
		(OR)		
	14.b.	Find the equation of the enveloping cylinder of the surface $ax^2 + by^2 + cz^2 = 1$ having the generator parallel to $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$.		
5	15.a.	Express $\frac{sin6\theta}{sin\theta}$ in terms of $\cos\theta$.	K3	CO5
		(OR)		
	15.b.	Expand $cos^6\theta$ and $cos^5\theta$ in series of cosines of multiples of θ.		

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	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.	K3	CO1
2	17	A plane passes through a fixed point (a,b,c) and cuts the axes in A, B, C. Analyse that the centre of the sphere OABC is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$.	K4	CO2
3	18	Investigate the condition for the equation $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2fxy = 0$ to represent a right circular cone. Obtain the equation of the axis and the vertical angle of the cone.	K3	CO3
4	19	Compute the equation of the right circular cylinder described on the circle through the points (a,0,0), (0, a,0), (0,0, a) as a guiding curve.	K4	CO4
5	20	Show that $\tan\frac{\pi}{11}.\tan\frac{2\pi}{11}.\tan\frac{3\pi}{11}.\tan\frac{4\pi}{11}.\tan\frac{5\pi}{11} = \sqrt{11}$.	K3	CO5

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