

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2024
(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	The equation of the x-axis is _____. (a) $y = 0, z = 0$ (b) $x = 0, z = 0$ (c) $x = 0, y = 0$ (d) none	K1	CO1
	2	If the two lines are coplanar, they must _____. (a) equal (b) intersect (c) parallel (d) none	K2	CO1
2	3	When the radius of the radius $u^2 + v^2 + w^2 - d$ is negative, the locus is an _____. (a) real sphere (b) point sphere (c) Imaginary sphere (d) greatest sphere	K1	CO2
	4	Intersection of two spheres is a _____. (a) sphere (b) great circle (c) real sphere (d) circle	K2	CO2
3	5	A _____ 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) right circular cone (b) circle (c) quadric cone (d) reciprocal cone	K1	CO3
	6	The cone touching the coordinate planes is _____ to the cone passing through the coordinates axes. (a) equal (b) reciprocal (c) opposite (d) not equal	K2	CO3
4	7	Any plane which intersects the cylinder whose equation is of second degree is a _____. (a) right circular cylinder (b) enveloping cylinder (c) conicoid (d) conic	K1	CO4
	8	The equation of the tangent plane is _____. (a) $axx_1 + byy_1 + czz_1 = 1$ (b) $axx_1 + byy_1 + czz_1 = 0$ (c) $alx_1 + bmy_1 + cnz_1 = 1$ (d) $alx_1 + bmy_1 + cnz_1 = 0$	K2	CO4
5	9	$x_n + \frac{1}{x_n} =$ _____. (a) $\cos n\theta$ (b) $\sin n\theta$ (c) $2 \cos n\theta$ (d) $2i \sin n\theta$	K1	CO5
	10	$2 \cosh^2 x - 1 =$ _____. (a) $\cosh nx$ (b) $\cosh 2x$ (b) $\sinh 2x$ (d) $\cosh^2 2x$	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 symmetrical form of the equations of the line of intersection of the planes $x + 5y - z - 7 = 0$, $2x - 5y + 3z + 1 = 0$.	K2	CO1
		(OR)		

Cont...

1	11.b.	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.	K2	CO1
2	12.a.	Find the equation to the sphere through the four points (2,3,1), (5,-1,2), (4,3,-1) and (2,5,3).	K2	CO2
	12.b.	(OR) Find the equation of a sphere which touches the sphere $x^2 + y^2 + z^2 - 6x + 2z + 1 = 0$ at the point (2,-2,1) and passes through the origin.		
3	13.a.	Find the equation of the cone with vertex O and base curve, the conic in which the surface $ax^2 + by^2 + cz^2 = 1$ is cut by the plane $l_1x + m_1y + n_1z = p$.	K2	CO3
	13.b.	(OR) Find the equations 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 the cylinder whose generators are parallel to the z axis and guiding curve is $ax^2 + by^2 = cz, lx + my + nz = p$.	K3	CO4
	14.b.	(OR) Find the tangents and tangent planes to the conicoid.		
5	15.a.	Express $\frac{\sin 6\theta}{\sin \theta}$ in terms of $\cos \theta$.	K3	CO5
	15.b.	(OR) If $\cos(x + iy) = \cos \theta + i \sin \theta$, prove that $\cos 2x + \cosh 2y = 2$.		

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	The straight lines $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$; $\frac{x-\alpha_1}{l_1} = \frac{y-\beta_1}{m_1} = \frac{z-\gamma_1}{n_1}$ are cut by a third whose direction cosines are λ, μ, ν . Show that the length intercepted on the third line is given by $\left \frac{\alpha - \alpha_1}{l} - \frac{\beta - \beta_1}{m} - \frac{\gamma - \gamma_1}{n} \right + \left \frac{l}{l_1} - \frac{m}{m_1} - \frac{n}{n_1} \right $ and deduce the length of the shortest distance.	K2	CO1
2	17	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	CO2
3	18	Find the angle between the lines in which the plane $ux + vy + wz = 0$ cuts the cone.	K3	CO3
4	19	Find 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	Expand $\sin^3 \theta \cos^5 \theta$ in a series of sines of multiples of θ .	K3	CO5