TOTAL PAGES: 2

**22MAU102N**

**PSG COLLEGE OF ARTS & SCIENCE**
(AUTONOMOUS)

**BSc DEGREE EXAMINATION MAY 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 | The equation of the y-axis is _____.<br>(a) $y = 0, z = 0$ (b) $x = 0, z = 0$<br>(c) $x = 0, y = 0$ (d) none | K1 | CO1 |
| | 2 | If the two lines are coplanar, if the shortest distance between them is _____.<br>(a) zero (b) not equal to zero<br>(c) less than zero (d) greater than zero | K2 | CO1 |
| 2 | 3 | When the radius of the radius $u^2 + v^2 + w^2 - d$ is positive, the locus is an _____.<br>(a) Imaginary sphere (b) point sphere<br>(c) real sphere (d) greatest sphere | K1 | CO2 |
| | 4 | Intersection of two spheres is a _____.<br>(a) sphere (b) great circle<br>(c) real sphere (d) circle | K2 | CO2 |
| 3 | 5 | The section of the right circular cone by any plane perpendicular to its axis is a _____.<br>(a) right circular cone (b) circle<br>(c) quadric cone (d) reciprocal cone | K1 | CO3 |
| | 6 | The equation of the cone passing through the axis is of the form _____.<br>(a) $2fyz + 2gzx + 2hxy = 0$<br>(b) $ax^2 + by^2 + cz^2 = 0$<br>(c) $2fyz + 2gzx + 2hxy = 1$<br>(d) $ax^2 + by^2 + cz^2 = 1$ | K2 | CO3 |
| 4 | 7 | If all planes perpendicular to the axis or a generator of a cylinder give only circles, the cylinder is called a _____.<br>(a) conicoid (b) enveloping cylinder<br>(c) right circular cylinder (d) conic | K1 | CO4 |
| | 8 | The intersection of a line and a quadric is ____.<br>(a) right circular cylinder (b) enveloping cylinder<br>(c) conicoid (d) conic | K2 | CO4 |
| 5 | 9 | $x_n - \frac{1}{x_n} =$ _____.<br>(a) $\cos n\theta$ (b) $\sin n\theta$<br>(c) $2\cos n\theta$ (d) $2i \sin n\theta$ | K1 | CO5 |
| | 10 | $\cosh^{-1} x =$ _____.<br>(a) $\log_e\left(x + \sqrt{x^2 + 1}\right)$ (b) $\log_e\left(x + \sqrt{x^2 - 1}\right)$<br>(c) $\log_e\left(x - \sqrt{x^2 - 1}\right)$ (d) $\log_e\left(x - \sqrt{x^2 + 1}\right)$ | K2 | CO5 |

**Cont...**

## 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) | | |
| | 11.b. | Find the condition that two given straight lines should be coplanar. | | |
| 2 | 12.a. | Find the equation of the sphere which has its centre at the point (6,-1,2) and touches the plane $2x - y + 2z - 2 = 0$. | K2 | CO2 |
| | | (OR) | | |
| | 12.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. | | |
| 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 $l_1x + m_1y + n_1z = p$. | K3 | CO3 |
| | | (OR) | | |
| | 13.b. | 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 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 equations of the tangent planes to $x^2 + y^2 + 4z^2 = 1$ which intersect in the line whose equations are $12x - 3y - 5 = 0, z = 1$. | | |
| 5 | 15.a. | Express $\frac{\sin 6\theta}{\sin \theta}$ in terms of $\cos \theta$. | K3 | CO5 |
| | | (OR) | | |
| | 15.b. | Separate into real and imaginary parts of $\tan^{-1}(x + iy)$. | | |

## 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 shortest distance between the lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}; \frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$. | K2 | CO1 |
| 2 | 17 | A plane passes through a fixed point (a,b,c) and cuts the axes in A,B,C. Show that the locus of the centre of the sphere OABC is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$. | K3 | CO2 |
| 3 | 18 | Find the condition for the equation $F(x,y,z) \equiv ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy + 2ux + 2vy + 2wz + d = 0$ to represent a cone. | K3 | CO3 |
| 4 | 19 | Find the locus of the point of intersection of three mutually perpendicular tangent planes to the central conicoid $ax^2 + by^2 + cz^2 = 1$. | K4 | CO4 |
| 5 | 20 | Expansion of $\sin^n \theta$ when $n$ is a positive integer. | K3 | CO5 |

Z-Z-Z END