PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch – **MATHEMATICS**

ANALYTICAL GEOMETRY

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks
One question from each unit (with four choices) (5 x 1 = 5)

1 The directrix of the conic $\frac{l}{r} = 1 + e\cos(\theta - \alpha)$ corresponding to the focus

(i) $\frac{l}{r} = 1 + e\cos(\theta + \alpha)$ (ii) $\frac{l}{r} = e\cos(\theta - \alpha)$

(iii) $\frac{l}{r} = 1 - e\cos(\theta - \alpha)$ (iv) $\frac{l}{r} = 1 + e\cos(\theta - \alpha)$

2 A straight line may be determined as the _____ of two planes.
(i) Union (ii) sum
(iii) intersection (iv)complement

3 When $u^2 + v^2 + w^2 - d$ is negative, the locus is an _____
(i) imaginary sphere (ii) real sphere
(iii) solid sphere (iv) tangent sphere

4 A right circular cone, the fixed point is called a _____
(i)Line (ii) Angle (iii) Axis (iv) Vertex

5 Any plane which intersects the cylinder whose equation is of second degree is a _____
(i)Conic (ii) Cylinder (iii) Sphere (iv) Circle

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks
One question from each unit with either or type (5 x 3 = 15)

6 a Trace the curve $\frac{12}{r} = 4 + \sqrt{3}(\cos\theta + 3\sin\theta)$

OR

b Derive the asymptotes of the conic $\frac{l}{r} = 1 + e\cos\theta$

7 a Find the image of the point (1,-2,3) in the plane $2x - 3y + 2z + 3 = 0$

OR

b Find the shortest distance between the lines
$\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1} = \frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$

8 a Find the co-ordinates of the centre and radius of the sphere
$2x^2 + 2y^2 + 2z^2 - 2x + 4y + 2z - 15 = 0$

OR

Cont...

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.

9 a 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.

OR

b Show that the equation of a right circular cone whose vertex is O, axis OZ and semi- vertical angle α is $x^2+y^2=z^2\tan^2\alpha$

10 a Derive the equation of the cylinder whose generators are parallel to the line $\frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ and whose guiding curve is $f(x,y,z)=0, ax+by+cz+d=0$

OR

b Find the equation of the cylinder whose generators are parallel to the z-axis and the guiding curve is $ax^2+by^2=cz, lx+my+nz=p$

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks

One question from each unit with either or type (5 x 6 = 30)

11 a Trace the curve $\frac{10}{r}=3\cos\theta+4\sin\theta+5$

OR

b A chord PQ of a conic subtends an angle of 2β of constant magnitude at the pole. Find the locus of the intersection of the tangents at P and Q.

12 a Find the symmetrical form of the equations of the line of intersection of the planes $x+5y-z-7=0, 2x-5y+3z+1=0$

OR

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.

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)

OR

b Find the equation of the sphere which touches $x^2+y^2+z^2-6x+2z+1=0$ at the point (2,-2,1) and passes through the origin.

14 a Derive the condition for the equation $F(x,y,z)=ax^2+by^2+cz^2+2fyz+2gzx+2hxy+2ux+2vy+2wz+d=0$ to represent a cone.

OR

b Find the conditions of the tangent planes to the cone $9x^2-4y^2+16z^2=0$ which contains the line $\frac{x}{32}=\frac{y}{72}=\frac{z}{27}$

15 a Derive the equation of the right circular cylinder with axis $\frac{x-\alpha}{l}=\frac{y-\beta}{m}=\frac{z-\gamma}{n}$ and radius of the guiding circle λ.

b Find the equation of a right circular cylinder of radius 3 with axis $\frac{x+2}{3}=\frac{y-4}{6}=\frac{z-1}{2}$

Z-Z-Z END