

Savitribai Phule Pune University
Hutatama Rajguru Mahavidyalaya, Rajgurunagar
F.Y.B.Sc.

MT-121: Analytical Geometry
(2019 Pattern) (Semester-II) (Paper-I) (12111)

Time: 2 Hours

Max. Marks: 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following: [5]

- a) Write formula for rotation of axes.
- b) Find the centre of the conic
$$3x^2 + 2xy + 3y^2 - 4x + 2y + 1 = 0.$$
- c) Find direction ratios of the line joining A(2,3,-1) and B(0,-1,2).
- d) Find centre and radius of sphere
$$x^2 + y^2 + z^2 + 2x - 4y - 6z + 5 = 0.$$
- e) Find the equation of the plane passing through the point (2,1,-3) and parallel to the plane $x + 2y + 3z = 8$.
- f) Write equation XY plane.
- g) Find the equation of the sphere having centre at (1,-2,3) and radius 3.

Q2) A) Attempt any one of the following [5]

- a) Find the angle θ through which the axes are rotated so that the transformed form of the expression $ax^2 + 2hxy + by^2$ is free from the product term.
- b) Show that equation of a plane which intercepts a, b, c on the co-ordinate axes is given by $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.

B) Attempt any one of the following [5]

- a) What does the equation $x^2 + 4xy + y^2 = 0$ become when the axes are rotated through an angle 45° .
- b) Find the angle between two lines whose direction cosines are connected by the relations $l + 2m - 2n = 0$, $3lm - ln - mn = 0$.

Q3) A) Attempt any one of the following [5]

- a) Find the equation of planes bisecting the angles between the planes $3x + 4y + 12z + 1 = 0$ and $x + 2y + 2z - 3 = 0$. Distinguish between them.
- a) Show that the equation of tangent plane to the sphere $x^2 + y^2 + z^2 = a^2$ at $P(x_1, y_1, z_1)$ is $xx_1 + yy_1 + zz_1 = a^2$.

B) Attempt any one of the following [5]

- a) Find the equation of plane containing the line of intersection of the planes $2x + 3y - z + 1 = 0, x + y + 2z + 3 = 0$ and passing through the point $(1, -2, 3)$.
- b) Find the distance from the point $(0, 0, 0)$ where the line $\frac{x+1}{1} = \frac{y+3}{3} = \frac{z-2}{-2}$ with the plane $3x + 4y + 5z = 5$.

Q4) A) Attempt any one of the following [5]

- a) Show that the angle between the line $\frac{x-x_1}{a_1} = \frac{y-y_1}{b_1} = \frac{z-z_1}{c_1}$ And the plane $a_2x + b_2y + c_2z + d = 0$ is

$$\sin \theta = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2} \sqrt{a_2^2 + b_2^2 + c_2^2}}$$

- b) Show that every equation of first degree in x,y,z represents a plane.

B) Attempt any one of the following [5]

- b) Show that the two lines are coplanar. Find the equation of the plane containing them $\frac{x-1}{-1} = \frac{y-8}{7} = \frac{z-2}{2}$ and $\frac{x+1}{1} = \frac{y-2}{-1} = \frac{z+4}{1}$.
- c) Find the equation of the tangent plane to the sphere $x^2 + y^2 + z^2 + 4x - 5y - 3z - 3 = 0$ at the point $(1, 2, -1)$ on it.