

BACHELOR OF SCIENCE (CBCS-2018 COURSE)
F. Y. B. Sc. Sem-II :SUMMER- 2022
SUBJECT : MATHEMATICS : ANALYTICAL GEOMETRY

Day : Wednesday
Date : 13-07-2022

S-18334-2022

Time : 11:00 AM-02:00 PM
Max. Marks : 60

N.B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.

Q.1 Attempt **ANY TWO** of the following: **(12)**

- a) Let OX, OY be the original system of rectangular axes. If these axes rotated through an angle θ without changing the origin so that new system of rectangular axes is OX' , OY' then prove that
$$x = x' \cos \theta - y' \sin \theta \text{ and}$$
$$y = x' \sin \theta + y' \cos \theta.$$
- b) The equation of conic is $7x^2 + 8xy + y^2 + 6x + 6y - 9 = 0$,
 - i) Find it's centre
 - ii) State it's nature
 - iii) Reduced the equation to standard form .
- c) Find the equation of the plane passing through the points (1, 2, -1), (-3, 1, 2) and containing the line whose direction ratios are (3, -5, 2).

Q.2 Attempt **ANY TWO** of the following: **(12)**

- a) Prove that the general equation of first degree in x, y, z given by $ax + by + cz + d = 0$ where a, b, c, d are constants (not all zero) represent a plane.
- b) Find the shortest distance between the lines
$$\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1} \text{ and } \frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1} .$$
- c) Show that the two lines
$$\frac{x-1}{-1} = \frac{y-8}{7} = \frac{z-2}{2} \text{ and } \frac{x+1}{1} = \frac{y-2}{-1} = \frac{z+4}{1}$$
are coplanar and find the equation of the plane containing them.

Q.3 Attempt **ANY TWO** of the following: **(12)**

- a) The α, β, γ are angles made by a line with positive directions of the co-ordinate axes, then prove that $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$.
- b) Show that the two spheres
 $x^2 + y^2 + z^2 - 2x - 6y - 15 = 0$ and $5x^2 + 5y^2 + 5z^2 - 10x + 26y + 42z + 107 = 0$ touches each other and find their point of contact.
- c) Find the equation of the smallest sphere passing through A (2, 2, 0) and B (2, 0, 2).

P.T.O.

Q.4 Attempt **ANY THREE** of the following: **(12)**

a) Find the points in which the line $\frac{x+1}{-1} = \frac{y-12}{5} = \frac{z-7}{2}$ cuts the cone $11x^2 - 5y^2 + z^2 = 0$.

b) Find the equation of right circular cylinder of radius 2 whose axis is the line $\frac{x}{1} = \frac{y}{-2} = \frac{z}{2}$.

c) Find the new form of the expression $x^2 - 2\sqrt{3}xy + y^2$ when the axes are rotated through angle 30° .

d) Find the angle between the lines

$$x + y + 2z - 3 = 0 = 2x + y + z + 1 \quad \text{and} \quad \frac{x-1}{2} = \frac{y}{1} = \frac{z-2}{-1}.$$

Q.5 Attempt **ANY FOUR** of the following: **(12)**

a) A line makes angles 45° , 60° with X and Y axes. Find the angle made by the line with Z axis.

b) Find direction cosines of a line whose direction ratios are 6, -2, 3.

c) Find the equation of the plane passing through the point (2, 1, -3) and parallel to the plane $x + 2y + 3z = 8$.

d) Find the equation of line joining the points (-2, 1, 3) and (3, 1, -2).

e) Find the equation of the sphere passing through (0, 0, 0), (0, 1, -1), (-1, 2, 0) and (1, 3, 2).

f) Define : i) Right circular cone
ii) Right circular cylinder.

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