

BACHELOR OF SCIENCE (CBCS-2018 COURSE)
F. Y. B. Sc. Sem-II : WINTER :- 2021
SUBJECT: MATHEMATICS : ANALYTICAL GEOMETRY

Day : Saturday
Date 29-01-2022

W-18334-2021

Time : 02:00 PM-05:00 PM
Max. Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.

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

- a) If under rotation of axes, without shifting the origin, the expression $ax^2 + 2hxy + by^2$ is transformed to $a'x'^2 + 2h'x'y' + b'y'^2$ then show that $a + b = a' + b'$.
- b) Reduce the equation $5x^2 + 6xy + 5y^2 - 10x - 6y - 3 = 0$ to the standard form and name the conic.
- c) Find the equation of the plane passes through the point $(2, -1, -1)$ and is parallel to the plane $x - 3y + 2z = 5$.

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

- a) Prove that the general equation of first degree in x, y, z via $ax + by + cz + d = 0$ where a, b, c, d are constants represent a plane.
- b) Find the angle between two lines whose direction cosines are connected by the relations $l + 2m - 2n = 0, 3lm - ln - mn = 0$.
- c) Find the shortest distance between the lines $\frac{x-3}{5} = \frac{y-1}{-7} = \frac{z-2}{3}$ and $\frac{x-2}{1} = \frac{y-3}{-2} = \frac{z+1}{1}$.
Also find the equation of the line.

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

- a) Show that following two spheres touches each other and find the point of touching:
 $x^2 + y^2 + z^2 - 4x - 2y - 4z + 5 = 0, x^2 + y^2 + z^2 - 6x - 6y + 17 = 0$.
- b) Find the equation of the sphere passing through the circle of intersection of $x^2 + y^2 + z^2 + 2x - 2y - 2z - 1 = 0$ and $2x - 2y + z - 1 = 0$ and passing through the point $(3, -1, 1)$. Also find its center and radius.
- c) Prove that the equation $ax^2 + by^2 + cz^2 + 2ux + 2vy + 2wz + d = 0$ represents a cone if $\frac{u^2}{a} + \frac{v^2}{b} + \frac{w^2}{c} = d$.

P.T.O.

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

- a) Find the equation of a right circular cylinder whose axis is the line $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$ and whose radius is 'r'.
- b) Find the points in which the line $\frac{x+1}{-1} = \frac{y-12}{5} = \frac{z-7}{2}$ cuts the cone $11x^2 - 5y^2 + z^2 = 0$.
- 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 line $3x - y + 2z - 1 = 0 = x + 2y + 2z - 5$ and the plane $x + 10z = 3$.

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

- a) Find the transformed form of the equation $2x^2 + 3xy - 4y^2 + x + 3 = 0$ when origin is shifted to the point $(1, -2)$.
- b) Find the equation of the sphere on AB as a diameter, where $A(2, -3, 1)$ and $B(-1, -2, 4)$.
- c) State the condition for coplanarity of two lines and equation of plane containing them.
- d) Test whether the line $\frac{x}{3} = \frac{y}{-1} = \frac{z}{2}$ is a generator of the cone $x^2 + 2y^2 + z^2 - 2yz + zx - 3xy = 0$.
- e) Define direction cosines of a line. Find the direction cosines of a line whose direction ratios are 6, -2, 3.
- f) State and derive the normal form of equation of a plane.

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