

F.Y.B.SC. SEM – II (2014 COURSE) : WINTER - 2017

SUBJECT : MATHEMATICS : ANALYTICAL GEOMETRY (M-21)

Day : Tuesday
Date : 07/11/2017

W-2017-0609

Time : 03.00 PM TO 05.00 PM
Max. Marks : 40

N.B.

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

Q.1 Attempt any **TWO** of the following: (10)

- a) Let Ox, Oy be the original frame of axes. If these axes are turned through an angle θ , so that new frame of axes is Ox', Oy' , then prove that $x = x' \cos \theta - y' \sin \theta$ and $y = x' \sin \theta + y' \cos \theta$
- b) Transform the equation $x^2 + 4xy + y^2 - 2x + 2y - 6 = 0$, when the origin is shifted to the point $(-1, 1)$ and then axes are turned through an angle 45° .
- c) Find the centre and lengths of axes of conic $x^2 - 5xy + 13y^2 - 3x + 21y = 0$.

Q.2 Attempt any **TWO** of the following: (10)

- a) Find the angle between the line $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$, and the plane $ax + by + cz + d = 0$.
- b) Find the equation of the sphere through the points $(0, 0, 0)$, $(-1, 2, 0)$, $(0, 1, -1)$ and $(1, 2, 3)$
- c) Find the equation of the plane through the points $(2, 2, 1)$ and $(9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z = 11$.

Q.3 Attempt any **TWO** of the following: (10)

- 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 equation of the quadratic cone which passes through the axes of coordinates and containing the points $A(1, 1, 1)$ and $B(-1, 2, 1)$.
- c) Find the equation of the right circular cone with vertex at $(2, -1, 4)$, semi-vertical angle $\cos^{-1}\left(\frac{4}{\sqrt{6}}\right)$ and the line $\frac{x-2}{1} = \frac{y+1}{2} = \frac{z-4}{-1}$ as the axis.

P.T.O.

Q.4 Attempt any **FIVE** of the following: **(10)**

- a) Obtain the new equation of the locus given by $x^2 + 6x + 2y + 1 = 0$, when the origin is changed to the point $(-3, 4)$, the directions of axes remaining the same.
- b) Find the new equation of $11x^2 + 24xy + 4y^2 - 5 = 0$ when the axes are turned through an angle of $\tan^{-1}\left(-\frac{4}{3}\right)$.
- c) Find the angle between the planes $x - y + z = 1$ and $3x + 2y - z + 7 = 0$.
- d) Find the equations of the line passing through the point $(2, -3, 4)$ and having direction ratios $3, 2, 1$.
- e) Find the equation of sphere whose centre is at $(1, -2, 3)$ and passing through the origin.
- f) Examine whether the line $\frac{x}{3} = \frac{y}{-1} = \frac{z}{2}$ is a generator of the cone $x^2 + 2y^2 + z^2 - 2yz + zx - 3xy = 0$.
- g) Find the equation of the sphere whose diameter is the join of the points $(-2, 3, 3)$ and $(2, 2, 1)$.

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