F.Y.B.SC. SEM – II (CBCS - 2016 Course) : WINTER - 2018

SUBJECT : MATHEMATICS : ANALYTICAL GEOMETRY

Day : Tuesday
Date : 23/10/2018

W-2018-0704

Time : 03.00 P.M. To 06.00 P.M
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 A) Choose the correct alternative of the following: **[06]**

i) Which of the following is a conic ____?
a) sphere **b)** cone **c)** ellipse **d)** none of these

ii) Parabola is a _____.
a) central conic
b) non-central conic
c) not a conic
d) none of these

iii) Coordincates of center of sphere $x^2 + y^2 + z^2 - x + y - z = 0$ are _____.
a) $(1, -1, 0)$ **b)** $(-1, 1, 0)$ **c)** $(1/2, -1/2, 0)$ **d)** None of these

iv) Section of a sphere by a plane is _____.
a) straight line **b)** circle **c)** plane **d)** none of these

v) $3x + 2y + z + 4 = 0$ is equation of _____.
a) plane **b)** sphere **c)** straight line **d)** none of these

vi) Skew lines are _____.
a) non-parallel lines of same plane.
b) non-parallel lines of different planes.
c) parallel lines of different planes.
d) none of these.

B) Attempt the following: **[06]**

i) State the rotation of axes formulae.

ii) Find the equation of a plane passing through the origin where direction ratios of normal to plane are 2, 1, 2.

iii) Find the radius of the sphere $x^2 + y^2 + z^2 - 2x + 4y - 3 = 0$.

iv) Find the equation of smallest sphere passing through $(1, 1, 2)$ and $(-2, 2, 3)$.

v) State the equation of line in space in unsymmetrical form.

vi) Define the term 'Cone'.

P.T.O.

Q.2 Attempt **ANY THREE** 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 $(-2, 1)$.

b) Find the distance of a point $(2, 3, 5)$ from the plane $2x + y - z = 4$.

c) Find the shortest distance between the skew lines given by:
$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-4}{4}$ and $\frac{x-3}{3} = \frac{y-4}{4} = \frac{z-5}{5}$.

d) Find the equation of sphere whose diameter is the join of the points $(-2, 3, 3)$ and $(2, 2, 1)$.

Q.3 Attempt **ANY FOUR** of the following: **[12]**

a) Find the angle between following pair of planes:
$2x - y + 2z + 3 = 0$; $6x + 3y + 2z - 5 = 0$.

b) Find whether the lines:
$\frac{x-1}{-1} = \frac{y-8}{7} = \frac{z-2}{2}$ and $\frac{x+1}{1} = \frac{y-2}{-1} = \frac{z+4}{1}$.

c) Find what the equation $x^2 + 4xy + y^2 = 0$ becomes when the axes are turned through an angle 45^0.

d) Find the equation of tangent plane to the sphere;
$x + y + z + 2ux + d = 0$, $1x + my + nz = p$

e) Show that following spheres touches each other and find point of touching:
$x^2 + y^2 + z^2 - 4x - 2y - 4z + 5 = 0$; $x^2 + y^2 + z^2 - 6x - 6y + 17 = 0$.

Q.4 Attempt **ANY TWO** of the following: **[12]**

a) Find the condition of tangency for the plane $1x + my + nz = p$ to be tangent plane to the sphere $x^2 + y^2 + z^2 = a^2$.

b) Find the angle between the lines whose direction cosines are connected by the relations $2l - m + 2n = 0$, $mn + nl + lm = 0$.

c) Discuss the nature of the conic $9x^2 - 24xy + 16y^2 - 2x - 39y - 11 = 0$. Reduce it to standard form, find vertex, focus, latus rectum.

Q.5 Attempt **ANY TWO** of the following: **[12]**

a) Determine the angle θ through which axes should be rotated so that the transformed form of the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is free from product term.

b) Show that general equation of second degree in x, y represents a conic.

c) Define the term plane. Show that general equation of first degree in x, y, z represents an equation of a plane.

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