F.Y.B.SC. SEM – II (CBCS - 2016 COURSE) : WINTER - 2017

SUBJECT: MATHEMATICS : ANALYTICAL GEOMAETRY

Day : **Tuesday** | **W-2017-0565** | Time : **03.00 PM TO 06.00 PM**
Date : **07/11/2017** | 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 alternatives of the following: **(06)**

i) When the origin is changed to the point (2, 1) then the equation $x^2 + y^2 - 4x - 2y - 20 = 0$ becomes

a) $X^2 + Y^2 = 5$ **c)** $X^2 + Y^2 = 25$

b) $X^2 - 4X - 5 = 0$ **d)** $Y^2 - 4X - 20 = 0$

ii) Equation of the line passing through the point (1, 2, 3) and having direction ratios 3, 4, 5 is

a) $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ **c)** $\frac{x-1}{3} = \frac{y-2}{4} = \frac{z-3}{5}$

b) $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ **d)** None of these

iii) Direction ratios of normal to the plane $x - 2y + z + 7 = 0$ are

a) 1, 2, 1 **c)** $-1, -2, -1$

b) $1, -2, 1$ **d)** $-1, 2, -1$

iv) Centre of the sphere $x^2 + y^2 + z^2 - 4x + 2y - 6z + 13 = 0$ is

a) $(2, -1, 3)$ **c)** $(-2, -1, 3)$

b) $(-2, 1, -3)$ **d)** $(2, -1, -3)$

v) If the line $\frac{x-2}{3k} = \frac{y+3}{2} = \frac{z+4}{1}$ is parallel to the plane $2x + 3y - 4z + 7 = 0$ then $k = \ldots$

a) 3 **c)** -3

b) $\frac{1}{3}$ **d)** $-\frac{1}{3}$

vi) The direction ratios of the line joining the points $A(-2, 1, -8)$ and $B(4, 3, -5)$ are

a) $6, -2, 3$ **c)** $6, 2, -13$

b) $-6, 2, 3$ **d)** None of these

B) Solve the following: **(06)**

i) Identify the conic given by the equation:

$5x^2 - 6xy + 5y^2 + 10x - 6y - 3 = 0.$

ii) Define Plane.

iii) Find the equation of the plane through the point (2, 3, 4) and having direction ratios of its normal are 2, 3, 0.

iv) Find a distance of the point (2, 3, 4) from the plane $3x - 6y + 2z + 11 = 0$.

v) Find the equation of the sphere whose radius is 3 and whose centre is $(1, -2, 4)$.

vi) Find the equation of the sphere having the join of

A $(-1, 2, 3)$ and B $(1, 3, -4)$ as a diameter.

P. T. O.

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

a) Find them equation of the sphere with intercepts a, b, c on the axes of co-ordinates and passing through the origin.

b) Find the equations of the two tangent planes to the sphere

$x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$, which are parallel to the plane $2x + 2y - z = 0$.

c) Find the shortest distance between the skew lines given by

$$\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1} \text{ and } \frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}.$$

d) Find the equation of the plane passing through three points (0, 1, 1), (1, 1, 2) and (–1, 2, – 2).

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

a) Find the equation of a plane which makes intercepts a, b, c respectively on the co-ordinate axes Ox, Oy, Oz.

b) Find the distance of the point of intersection of the line

$\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ and the plane $x + y + z - 17 = 0$ from the point (3, 4, 5).

c) Show that the plane $2x - 2y + z + 16 = 0$ touches the sphere $x^2 + y^2 + z^2 + 2x - 4y + 2z - 3 = 0$.

d) Equation of the cone is $x^2 + 2y^2 + z^2 - 2yz + zx - 3xy = 0$.

Test whether the following lines are generators of this cone:

i) $x = y = z$ **ii)** $\frac{x}{2} = \frac{y}{3} = \frac{z}{2}$ **iii)** $\frac{x}{3} = \frac{y}{-1} = \frac{z}{2}$.

e) Obtain the new equation of the locus given by $3x^2 + y^2 + 18x - 8y - 16 = 0$, when the origin is changed to the point (– 3, 4), the direction of axes remaining the same.

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

a) If the axes are rotated through an angle θ, without change of origin , the expression $ax^2 + 2hxy + by^2$ *becomes* $a'x'^2 + 2h'x'y' + b'y'^2$ then show that $a + b = a' + b'$.

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 the axes are turned through an angle 45^0

c) Find the centre and lengths of axes of conic $11x^2 + 4xy + 14y^2 - 4x - 28y - 16 = 0$.

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

a) Find the equation of a right circular cylinder whose axis is the line $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\chi}{n}$ and whose radius is r.

b) Find the equation of the right circular cylinder of radius 3 whose axis passes through (2, – 1, 3) and has direction cosines proportional to 1, 2, - 2.

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.

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