SLR-ST – 35

Seat No.	

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B.Sc. – I (Semester – II) (CBCS) Examination, 2018
MATHEMATICS (Paper – III)
Geometry

Day and Date : Saturday, 21-4-2018 Max. Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

***Instructions**: 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*

1. Select the correct alternative for each of the following : **14**

1) The general second degree equation represent an ellipse if and only if

a) $\Delta \neq 0, ab - h^2 < 0$ b) $\Delta \neq 0, h^2 - ab = 0$

c) $\Delta \neq 0, ab - h^2 > 0$ d) None of these

2) If by rotation of axes through an angle θ the expression $3x^2 + 2xy + 3y^2 - 18x - 22y + 50 = 0$ does not contain the cross product term xy then θ =

a) $\frac{\pi}{3}$ b) $\frac{\pi}{6}$ c) $\frac{\pi}{4}$ d) None of these

3) The polar form of cartesian equation $(x^2 + y^2)^2 = a^2(x^2 - y^2)$ is

a) $r = a^2 \cos 2\theta$ b) $r^2 = a^2 \cos 2\theta$

c) $r^2 = a \cos 2\theta$ d) None of these

4) $(\sqrt{3}, 1)$ is the cartesian co-ordinate of a point then its polar co-ordinate is

a) (2, 30°) b) (3, 30°) c) (–2, 30°) d) None of these

5) If OP is the diagonal of a unit cube with edges OX, OY, OZ then the direction cosines of OP are

a) (1, 1, 1) b) $(\sqrt{3}, \sqrt{3}, \sqrt{3})$

c) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ d) None of these

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6) Angle between two plane $2x - y + z = 6$ and $x + y + 2z = 7$ is

a) $\pi/2$ b) $\pi/4$ c) $\pi/3$ d) None of these

7) The distance of a plane $3x + 4y - 2z = 6$ from the origin is

a) $\frac{3}{\sqrt{2g}}$ b) $\frac{6}{\sqrt{2g}}$ c) $\frac{4}{\sqrt{2g}}$ d) None of these

8) The intersect on Y axis made by the plane $x + 2y + z = 2$ is

a) 3 b) 2 c) 1 d) None of these

9) The locus of $y = 0$ is

a) ZX plane b) XY plane c) YZ plane d) None of these

10) The radius of the sphere $x^2 + y^2 + z^2 - 4x - 6y + 8z + 4 = 0$ is

a) 5 b) 4 c) 3 d) None of these

11) The intersection of two sphere is

a) Circle b) Straight line c) Plane d) None of these

12) The equation of tangent plane at (x_1, y_1, z_1) to the sphere $x^2 + y^2 + z^2 = a^2$ is

a) $xx_1 - yy_1 + zz_1 = a^2$ b) $xx_1 + yy_1 + zz_1 = a^2$

c) $xx_1 + yy_1 + zz_1 = a$ d) None of these

13) The centre of sphere $2x^2 + 2y^2 + 2z^2 - 4x - 8y + 4z + 5 = 0$ is

a) (1, 2, –1) b) (–1, 2, –1) c) (1, 2, 1) d) None of these

14) If $S = 0$ is sphere and $U = 0$ is plane then $S + \lambda U = 0$ represents family of

a) Sphere b) Circle c) Plane d) None of these

2. Attempt **any seven** of the following : **14**

1) Transform the equation $x^2 - 4xy + 3y^2 - 10x + 16y + 21 = 0$ to parallel axes through the point (1, –2).

2) Write the transform equation if the co-ordinate axes are rotated the angle 30°.

3) Find the cartesian co-ordinate of the point where polar co-ordinate are $\left(4, \frac{\pi}{3}\right)$.

4) Find the equation of the plane whose x intercept, y intercept and z intercept are 3, 4 and 7 respectively.

5) Show that the three points (–2, 3, 5) (1, 2, 3) (7, 0, –1) are collinear.

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6) Find the equation of the plane which passes through the point (2, –3, 4) and is parallel to the plane $2x - 5y - 7z = 6$.

7) Find the equation of the sphere whose centre (2, 3, 5) and radius 2.

8) Find the equation of sphere having the join of A (1, –2, 3) and B (–3, 1, 2) as a diameter.

9) Find K if (2, –1, 1) lies on the sphere $x^2 + y^2 + z^2 + 4x + 2y - 2z - k = 0$.

3. A) Attempt **any two** of the following : **10**

1) Transform the equation $x^2 + 4xy + y^2 = a^2$ when axes are rotated through an angle $\pi/4$.

2) Find equation of plane in normal form.

3) Show that the second degree equation $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ represent a sphere with centre

(– u, –v, –w) and radius $\sqrt{u^2 + v^2 + w^2 - d}$.

B) Identify the conic $4x^2 - 12xy + 9y^2 + 4x - y - 5 = 0$. **4**

4. Attempt **any two** of the following : **14**

1) If by rotation of axes the expression $ax^2 + 2hxy + by^2$ becomes $a'x'^2 + 2h'x'y' + b'y'^2$ then prove that $a + b = a' + b'$ and $ab - h^2 = a'b' - h'^2$.

2) Show that the equation of the plane tangent to sphere

$x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at point (x_1, y_1, z_1) is
$xx_1 + yy_1 + zz_1 + u(x + x_1) + v(y + y_1) + w(z + z_1) + d = 0$.

3) Find the equation of plane through three points (2, 2, –1) (3, 4, 2) (7, 0, 6).

5. Attempt **any two** of the following : **14**

1) Show that the plane $2x + 2y + z + 16 = 0$ touches the sphere $x^2 + y^2 + z^2 + 2x - 4y + 2z = 3$ also find point of contact.

2) By rotation an axes through an angle θ show that $g^2 + f^2$ is invariant in the equation of curve $ax^2 + 2hxy + 6y^2 + 2gx + 2fy + c = 0$.

3) a) Find the acute angle between the planes $2x - y + z = 6$, $x + y + 2z = 3$.

b) Obtain the equation of the plane through the point (–1, 3, 2) and perpendicular to planes $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$.

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