

END OF SEMESTER EXAMINATIONS, APRIL / MAY 2017

MATHEMATICS PAPER – IV

SUBJECT CODE: 14UBMA08

MAJOR: B.Sc. CHEMISTRY

TIME : 3 HOURS

SEMESTER : II

MAX.MARKS: 75

SECTION – A (5 X 2 = 10)Answer ALL Questions:

1. State the condition for two circles to cut one another orthogonally.
(OR)
2. Show that the circles $x^2 + y^2 - 6x - 9y + 13 = 0$ and $x^2 + y^2 - 2x - 16y = 0$ touch each other.
3. State any two properties of conjugate diameters.
(OR)
4. Find the eccentricity of the ellipse if $y = x$ and $3y = -2x$ are a pair of its conjugate diameters.
5. Write down the formula to find the area of a triangle when the polar co-ordinates of the angular points $(r_1, \theta_1), (r_2, \theta_2), (r_3, \theta_3)$.
(OR)
6. Write down the asymptotes of the conic $\frac{l}{r} = 1 + e \cos \theta$.
7. Find the equation the plane which passes through the point $(-1, 3, 2)$ and is parallel to the plane $x - y + z = 3$.
(OR)
8. Find the distance between the parallel planes $4x + 3y - 12z + 6 = 0$ and $4x + 3y - 12z - 9 = 0$.
9. Find the centre and radius of the sphere $x^2 + y^2 + z^2 - 6x + 8y - 10z + 1 = 0$.
(OR)
10. Find the equation of the sphere with centre at $(3, 2, -1)$ and passing through the point $(-1, 1, 2)$.

SECTION – B (5 X 4 = 20)Answer ALL Questions:

11. Obtain the equation of a circle which passes through the point $(1, 2)$ bisects the circumference of the circle $x^2 + y^2 = 9$ and cuts orthogonally the circle $x^2 + y^2 - 2x + 8y - 7 = 0$.
(OR)
12. Find the equation of a circle passing through the point $(1, 2)$ and the common points of the circles $x^2 + y^2 - 2x + 3y - 1 = 0$ and $x^2 + y^2 + 3x - 2y - 1 = 0$.
13. If the normals at the four points $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ and (x_4, y_4) on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are concurrent, then prove that $(x_1 + x_2 + x_3 + x_4) \left(\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \frac{1}{x_4} \right) = 4$.
(OR)
14. Prove that if a pair of diameters be conjugate with respect to a hyperbola, they will be conjugate with respect to the conjugate hyperbola.
15. Find the locus of the foot of the perpendicular drawn from the pole to the tangents to the Circle $r = 2a \cos \theta$.
... 2 ...

(OR)

16. Prove that the chords of a rectangular hyperbola which subtend a right angle at a focus touch a fixed parabola.

17. Find the equation of the planes bisecting the angle between the planes $2x+2y+z+6=0$ and $3x+12y-4z-10=0$.

(OR)

18. Find the equation of the plane through the point $(-2, 3, 1)$ and the intersecting line of the planes $x+4y-2y+9=0$ and $2x-3y+z=5$.

19. Find the equation of the sphere which has its centre at the point $(6, -1, 2)$ and touching the plane $2x-y+2z-2=0$.

(OR)

20. A plane passes through a fixed point (a, b, c) . Show that the locus of the foot of the perpendicular from the origin to the plane is the sphere $x^2+y^2+z^2-ax-by-cz=0$.

SECTION - C (5 X 9 = 45)

Answer ALL Questions:

21. Find the equation to the circle whose diameter is the common chord of the two circles $(x-a)^2+y^2=a^2$ and $x^2+(y-b)^2=b^2$. Find also the length of the common chord.

(OR)

22. Find the limiting points of the system of circles coaxial with $x^2+y^2-6x-6y+4=0$, $x^2+y^2-2x-4y+3=0$.

23. If the normals at the points whose eccentric angles are α, β, γ are concurrent, then show that $\sin(\beta+\gamma) + \sin(\gamma+\alpha) + \sin(\alpha+\beta) = 0$.

(OR)

24. Prove that the acute angle between two conjugate diameters of an ellipse is a minimum when they are equal.

25. A chord PQ of a conic subtends an angle of 2β of constant magnitude at the pole. Find the locus of the intersection of the tangent at P and Q.

(OR)

26. Derive the equation of the chord of the conic $\frac{l}{r} = 1 + e \cos \theta$ joining the points whose vectorial angles are $\alpha - \beta$ and $\alpha + \beta$.

27. Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+1}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$. Determine also its equations.

(OR)

28. Find the image of the point $(1, 2, -3)$ on the plane $3x-3y+10z=26$.

29. Find the equation of the sphere which has its centre on the plane $5x+y-4z=0$ and passing through the circle $x^2+y^2+z^2-3x+4y-2z+8=0$, $4x-5y+3z-3=0$.

(OR)

30. Show that the intersection of the two spheres $x^2+y^2+z^2-2x-4y+6z-2=0$, $x^2+y^2+z^2-4x-6y+4z+4=0$ is a circle lying in the plane $x+y+z=3$. Find its centre and radius.

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