B.Sc. B.Ed SEM-II Examination: 2020

Course-CC2.1

Subject: Mathematics (2D and 3D Geometry and Differential Equations-I)

Time: 2 Hours **F.M. 50**

Answer any ***ten*** questions **(5 × 10 = 50)**

1. Find the equation of the tangents to the conic $x^2 + 4xy + 3y^2 - 5x - 6y + 3 = 0$ which are parallel to the straight line $x + 4y = 0$.
2. Perpendiculars PL, PM, PN are drawn from the point P (a, b, c) to the co-ordinate planes. Show that the equation of the plane LMN is $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 2$.
3. A plane passing through a fixed point (a, b, c) cuts the axes in A, B, C. Show that, the locus of the centre of the sphere OABC is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$.
4. A plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ meets the coordinate axes at A, B, C. Find the equation of the cone generated by the straight lines drawn from O to meet the circle ABC.
5. Find the equation of the cylinder whose generators are parallel to the straight line $\frac{x}{-1} = \frac{y}{2} = \frac{z}{3}$ and whose guiding curve is $x^2 + y^2 = 9, z = 1$.
6. Show that the value of k for which the plane $x + ky = 2$ intersects the elliptic. paraboloid $\frac{x^2}{2} + \frac{z^2}{3} = y$ in (i) an ellipse, is $k \neq 0, k \geq \frac{-1}{4}$, (ii) a parabola, is $k = 0$.
7. Solve the following differential equation: $(xy^2 - e^{\frac{1}{x^3}})\,dx - x^2 y dy = 0$.
8. Show that the general solution of the equation $\frac{dy}{dx} + py = Q$ can be written in the form of $y = k(u - v) + v$ where, k is a constant and u and v, are its two particular solutions.
9. Solve: $y\{(\frac{dy}{dx})^2 - 1\} = (x^2 - y^2)\frac{dy}{dx}$.
10. Solve, using the method of undetermind coefficients: $(D^2 + 4) = \sin 2x$.
11. Solve: $x^2 \frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - y = 3x^3 \cos(logx)$.
12. Solve the differential equation: $(x + a)^2 \frac{d^2y}{dx^2} - 4(x + a)\frac{dy}{dx} + 6y = x$.