

### PART – A

ANSWER ALL QUESTIONS:

(10 × 2 = 20)

- 1) Find the  $n^{\text{th}}$  derivative of  $e^{ax+b}$ .
- 2) State the formula for polar subnormal and subtangent.
- 3) Write the condition for maxima and minima of two variables.
- 4) State the formula for centre of curvature.
- 5) What is the radius of curvature of the curve  $y = e^x$  at the point where it crosses the y-axis?
- 6) Define Evolutes.
- 7) Determine the quadratic equation with  $1 - \sqrt{-7}$  as a root.
- 8) Define a reciprocal equation.
- 9) State Descart's rule of sign for negative roots.
- 10) Diminish the roots by 2 of the equation  $2x^5 - 2x^4 + 3x^3 - 2x^2 - x - 5 = 0$ .

### PART – B

ANSWER ANY FIVE QUESTIONS:

(5 × 8 = 40)

- 11) If  $y = (\sin^{-1}x)^2$  prove that  $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0$ .
- 12) Show that the parabola  $r = a \sec^2 \frac{\theta}{2}$  and  $r = b \operatorname{cosec}^2 \frac{\theta}{2}$  intersect at right angle.
- 13) Find the maximum and minimum values of  $f(x, y) = x^4 + y^4 - 4xy + 1$ .
- 14) Find the radius of curvature at the point  $(\frac{a}{4}, \frac{a}{4})$  to the curve  $\sqrt{x} + \sqrt{y} = \sqrt{a}$ .
- 15) Find the (p-r) equation for the curve  $r \sin \theta + a = 0$ .
- 16) Solve :  $x^5 + 4x^4 + 3x^3 + 3x^2 + 4x + 1 = 0$ .
- 17) Find the sixth powers of the equation  $x^7 - x^4 + 1 = 0$ .
- 18) Solve the equation  $x^4 - 2x^3 + 4x^2 + 6x - 21 = 0$ , given that two of its roots are equal in magnitude and opposite in sign.

**PART – C**

**ANSWER ANY TWO QUESTIONS:**

**(2 × 20 = 40)**

19) a) State and prove Leibnit'z formula for  $n^{\text{th}}$  derivative of a product.

b) If  $y = a \cos(\log x) + b \sin(\log x)$  prove that

$$x^2 y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0.$$

20) Find the maximum of  $a^3 x^2 + b^3 y^2 + c^3 z^2$  with the condition  $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ .

21) a) Find the asymptotes of  $x^3 + 2x^2 y + xy^2 - x^2 - xy + 2 = 0$ .

b) Solve  $x^3 - 12x^2 + 39x - 28 = 0$  whose roots are in arithmetical progression.

22) Find the positive root of the equation  $x^3 - 2x^2 - 3x - 4 = 0$  correct to 3 places of Decimals.

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