Reg. No:

Time: 3 hours   Max. Marks: 60

PART-A
(Answer all the Questions **5 x 2 = 10** Marks)

1   **a**   Solve $\dfrac{dy}{dx} + y = x$.   **2M**

    b   Solve $\dfrac{d^4 x}{dt^4} + 4x = 0$.   **2M**

    c   Evaluate $\displaystyle\int_0^1 \int_0^1 \int_0^1 e^{x+y+z}\,dxdydz$ **2M**

    d   Write Cauchy's Riemann equations in polar form.   **2M**
    e   State Cauchy's residue theorem.   **2M**

PART-B
(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2   Solve $3x(1-x^2)y^2 \dfrac{dy}{dx} + (2x^2 - 1)y^3 = ax^3$.   **10 M**

OR

3   **a**   Solve $p^2 + 2py\cot x = y^2$.   **5M**
    b   Solve $y = p\sin p + \cos p$.   **5M**

UNIT-II

4   **a**   Solve $(D^2 + a^2)y = \tan ax$ by method of variation of parameters.   **5M**

    b   Solve $x^2 \dfrac{d^2 y}{dx^2} - x\dfrac{dy}{dx} + y = \log x$.   **5M**

OR

5   Solve in series the equation $x\dfrac{d^2 y}{dx^2} + \dfrac{dy}{dx} + xy = 0$.   **10 M**

UNIT-III

6   Change the order of integration in $\displaystyle\int_0^1 \int_x^{\sqrt{2-x^2}} \dfrac{x}{\sqrt{x^2 + y^2}}\,dxdy$ and hence evaluate it.   **10 M**

OR

7   Evaluate $\displaystyle\int_0^a \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \dfrac{dxdydz}{\sqrt{1 - x^2 - y^2 - z^2}}$.   **10 M**

UNIT-IV

8   **a**   Determine p such that the function $f(z) = \dfrac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\dfrac{px}{y}\right)$.   **5M**

    b   Find all the values of k, such that $f(x) = e^x(\cos ky + i\sin ky)$.   **5M**

OR

9   **a**   Prove that the bilinear transformation maps circles into circles.   **5M**

     b   Show that a bilinear transformation preserves cross ratio of four points.   **5M**

UNIT-V

10   Evaluate $\oint_C \dfrac{z^3}{(z-1)^4(z-2)(z-3)}\,dz$ where C is the circle $|z| = 2.5$ by residue theorem.   **10 M**

OR

11   Show that $\displaystyle\int_0^{2\pi} \dfrac{d\theta}{1+a^2-2a\cos\theta} = \dfrac{2\pi}{1-a^2}$, $0 < a < 1.$ **10 M**

END