**Roll No.** □□□□□□□□□□□□ **Total No. of Pages : 02**

**Total No. of Questions : 09**

**B.Tech. (CSE/IT) (Sem.–4th)**

# MATHEMATICS-III

**Subject Code : CS-204**

**Paper ID : [A0495]**

**Time : 3 Hrs.** **Max. Marks : 60**

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

## SECTION-A

1. Write short notes on :

(a) Find the point where the Cauchy-Riemann equations are satisfied for the function $f(z) = xy^2 + ix^2y$.

(b) State fundamental theorem of integral calculus.

(c) Find the deflection of a vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $f(x) = k$ (sin $x$ – sin $2x$).

(d) Explain briefly the Picard's method for the numerical solution of the differential equation $\frac{dy}{dx} = f(x, y)$

(e) State Roll's Theorem.

(f) Write the general linear partial differential equation of second order in two independent variables. Under what conditions it will be parabolic?

(g) Determine the poles of the function

$f(z) = \frac{z^2}{(z-1)^2 (z+2)}$. Also find the residue at the "pole of order 2".

(h) Find the area of the segment cut off from the parabola $x^2 = 8y$ by the line $x - 2y + 8 = 0$.

(i) A rod of length $l$ with insulated sides is initially at a uniform temperature $u_0$, its ends are suddenly cooled to 0°C and are kept at that temperature. If it is required to find the temperature function $u(x, t)$ then write down the initial and the boundary conditions.

(j) State Laurent's theorem.

## SECTION-B

2. Find the bilinear transformation which maps the points $z = 1, i = -1$ onto the points $i, o, -i$.

3. Find the volume of the tetrahedron bounded by the Co-ordinate planes and the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$.

4. State and prove Cauchy's Integral formula.

5. Find by Taylor's series method, the value of $y$ at $x = 0{\cdot}1$ to five places of decimals from $\frac{dy}{dx} = x^2y - 1$, $y(0) = 1$.

6. Use the method of Separation of variables to solve the equation $\frac{\partial^2 V}{\partial x^2} = \frac{\partial V}{\partial t}$ given that $v = 0$, when $t \to \infty$ well as $v = 0$ at $x = 0$ and $x = l$.

## SECTION-C

7. Apply Runge-Kutta method to find an approximate value of $y$ when $x = 0{\cdot}2$ (in two steps) given that $\frac{dy}{dx} = x + y$, $y = 1$, when $x = 0$.

8. Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ by contour integration in the complex plane.

9. A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$, if it is released from rest from this position, find the displacement $y(x, t)$.