## Mathematics III

## Subject code:CS-204

## B. Tech.

## A0495

**Section - A**

**Q. 1:**

(i) Verify Rolle's Theorem for f$(x) = x(8-x)m \quad [0,8]$

(ii) Evaluate $\int_0^1 \int_0^{x^2} e^{\frac{y}{x}} dydx$

(iii) Evaluate $\oint_c \frac{zdz}{(z-1)(z-3)}$ value $Cu\ |z| = \frac{3}{2}$

(iv) Find the poles and residues at each pole of function 'cot

(v) Find the image of line $y - x + 1 = 0$ under the mapping $w = \frac{1}{z}$

(vi) A string of length 'e' is initially at rest in equilibrium position and each of its points is given two velocity v(x) write down boundary and initially conditions.

(vii) If $L[f(t)] = F(s).ie$ Laplace transform of $f(t)u'F(s)$.

$f(0) = 1,\ f'(0) = -1$ find $L\,(f''(t))$

(viii) Find fourier transform of $e^{-|x|}$

(ix) Using Taylor's series method compare the solution of $\frac{dy}{dx} = y^2 + x, y(0) = 1$ at $x = 0.1$

(x) State diagonal five point formula for finding value of U at any interior mesh point.

**Section : B**

Q. 2 : Find the volume bounded by the $xy$ plane, the Cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$

Q. 3: If $f(z)$ is analytic function $fz$ prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |Ref(z)|^2 = 2|f^1(z)|^2$

Q. 4: Find the transformation which maps the points $-1, i, 1$ of the z plane onto $1, i, -1$ of the $\omega$ plane

Q. 5: A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is

$$u\,(x, 0) = \begin{cases} x, & 0 \leq x \leq 50 \\ 100 - x, & 50 \leq x \leq 100 \end{cases}$$

Find the temperature $U(x, t)$ at any time.

Q. 6: Using Range - Kaft method of 4th order find y at $x = 1.1$ given that $y^1 = x^2 + y^2$, $y\,(1) = 1.5$

**Section - C**

Q. 7: Evaluate $\int_0^{2\pi} \frac{d\theta}{1-2pCos\theta+p^2}, 0 < p < l$ by contour integration

Q. 8: A tightly structured string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y0\, Sin^3(\frac{\pi x}{l})$. If it is released from rest from this position. Find the displacement $y(x, t)$.

Q. 9: Solve $\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial y^2} = 0$ by Leibman's method over the square mesh of side Four units satisfying the followings boundary conditions

(i) U $(0, y) = 0$ for $0 \leq y \leq 4$ (ii) U $(4, y) = 12 + y, 0 \leq y \leq 4$

(iii) U $(x, 0) = 3x,\ 0 \leq x \leq 4$ (iv) U $(x, 4) = x^2, 0 \leq y \leq 4$

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