



Reg. No. :

Name :

**Fourth Semester B.Tech. Degree Examination, May 2015
(2013 Scheme)**

13.401 : ENGINEERING MATHEMATICS – III (BCHMNPSU)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries 4 marks.



1. Show that $w = \frac{1}{z}$ is analytic except at $z = 0$.
2. Evaluate $\int_C \frac{(1+z)\sin z}{(2z-1)^2} dz$ where $C : |z-i|=2$ using Cauchy's integral formula.
3. Find the value of $\sqrt{35}$ using Newton-Raphson method.
4. Find the critical and fixed points of $w = \frac{5-4z}{4z-2}$.
5. Determine a, b, c, d so that function $f(z) = (x^2 + axy + by^2) + i(cx^2 + dxy + y^2)$ is analytic.

PART – B

Answer **one full** question from each module. **Each** question carries **20** marks.

Module – I

6. a) Determine the analytic function whose real part is $u = e^{-x} (\cos y + \sin y)$. 7
- b) Discuss about the conformal mapping $w = \sin z$. 7
- c) Find the bilinear transformation which maps the points $z = 1, -i, i$ onto the points $2i, \infty, 0$. 6



7. a) State and prove the necessary conditions for a function $f(z) = u(x, y) + iv(x, y)$ to be analytic. 8
- b) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. 5
- c) If $f(z)$ is analytic function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)R(f(z))^2 = 2|f'(z)|^2$. 7

Module – II

8. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{2 + \cos \theta}$ 10
- b) State Cauchy's residue theorem. Then calculate residue of $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ at $z = 1$. 10
9. a) Evaluate $\int_{-\infty}^{\infty} \frac{dx}{(x^2 + 1)^2}$. 10
- b) Find the Laurentz series $f(z) = \frac{1}{(z+1)(z+3)}$ valid for $1 < |z| < 3$. 6
- c) Define the following :
- i) Poles
 - ii) Essential singularity
 - iii) Removable singularity. 4

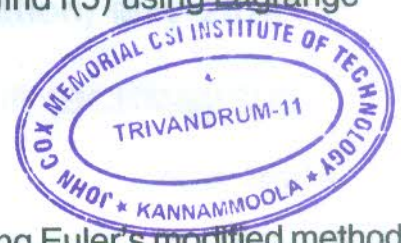
Module – III

10. a) Solve the following system of equation by Gauss-Seidel method 10
 $8x + y + z = 8$, $2x + 4y + z = 4$, $x + 3y + 3z = 5$.
- b) Use Gauss forward interpolation formula to find y at $x = 0.68$ given that
- | | | | | | | | |
|------------|--------|--------|--------|--------|--------|--------|--------|
| x : | 0.5 | 0.55 | 0.60 | 0.65 | 0.70 | 0.75 | 0.80 |
| y : | 0.1915 | 0.2088 | 0.2258 | 0.2422 | 0.2580 | 0.2734 | 0.2881 |
- 10



11. a) Find a positive root of $f(x) = x^3 + x^2 - 1$ by Bisection method correct to 4 places. 10
- b) If $f(1) = 4, f(3) = 120, f(4) = 340, f(6) = 2544$ then find $f(5)$ using Lagrange Interpolation formula. 10

Module – IV



12. a) Solve the equation of $\frac{dy}{dx} = 1 - y$ given $y(0) = 0$ using Euler's modified method and Tabulate the solutions at $x = 0.1, 0.2$ and 0.3 . 10
- b) The velocity of a particle at distance 'S' from a point on its path is given by the table below.

S(in metre) :	0	10	20	30	40	50	60
V(m/sec) :	47	58	64	65	61	52	38

Estimate the time taken to travel 60 metres by using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule. 10

13. a) Solve $\nabla^2 u = 0$ satisfying the following boundary conditions
- $u(0, y) = 0, u(4, y) = 12 + y$ for $0 \leq y \leq 4$
- $u(x, 0) = 3x, u(x, 4) = x^2$ for $0 \leq x \leq 4$. 10
- b) Use Runge-Kutta 4th order to solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given $y(0) = 1$ at $x = 0.2, 0.4$. 10
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