

Name :

**Fourth Semester B.Tech. Degree Examination, June 2016
(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 $\cosh z$ is analytic and then find its derivative.
2. Evaluate $\int_C \frac{3z^2 + 2}{(z^2 + 1)(z^2 + 9)}$ where C is $|z| = 2$.
3. Solve the following system of equations using Gauss elimination method
 $x - y + z = 1, -3x + 2y - 3z = -6, 2x - 5y + 4z = 5$.
4. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule with $h = 0.2$.
5. Determine a positive root of the equation $x^3 - 4x - 9 = 0$ by bisection method.

PART – B

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

Module – I

6. a) Show that an analytic function $f(z) = u + iv$ with constant modulus is constant. **7**
b) Find the bilinear transformation which maps $z = 0, -1, \infty$ into $w = -1, -2 - i, i$. **7**
c) If $f(z) = u + iv$ is analytic function, find $f(z)$ if $u - v = e^x (\cos y - \sin y)$ **6**
7. a) Discuss about the transformation $w = z^2$. **8**
b) Show that $f(z) = \frac{x + iy}{x^2 + y^2}$ is analytic except at $z = 0$. **6**
c) Let $f(z) = u + iv$ is analytic function of z , then prove that the family of curves $u(x, y) = c_1$ and $u(x, y) = c_2$ form an orthogonal system. **6**

P.T.O.



Module - II

8. a) Evaluate $\int_0^{2\pi} \frac{1}{(5 - 3 \cos \theta)^2} d\theta$. 10

b) Evaluate $\oint_C \frac{dz}{(z^2 + 4)^2}$ where C is the circle $|z| = 2$. 10

9. a) Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2 + 1)(x^2 + 4)} dx$. 10

b) Find the Taylor series of $f(z) = \frac{z}{(z + 1)(z + 2)}$ about $z = 2$. 5

c) Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along the line $y = \frac{x}{2}$. 5

Module - III

10. a) Calculate $y(4)$, $y(23)$ from the data given below. 10

$x: 0 \quad 5 \quad 10 \quad 15 \quad 20 \quad 25$

$y: 7 \quad 11 \quad 14 \quad 18 \quad 24 \quad 32$ using Newton's interpolation formula.

b) Solve the system of equation by using Gauss elimination method : 7

$5x - 9y - 2z + 4w = 7, 3x + y + 4z + 11w = 2, 10x - 7y + 3z + 5w = 6,$
 $-6x - 8y - z - 4w = 5$

c) Find $f(9.1)$ using Lagrange interpolation formula. Given 3

$x: \quad 8.9 \quad \quad 9 \quad \quad 9.3$

$f(x): \quad 0.3 \quad \quad 3.5 \quad \quad 0.25$

11. a) Solve the following system of equations by using Gauss-Seidel method correct to 3 decimal places $30x - 2y + 3z = 75, 2x + 2y + 18z = 30, x + 17y - 2z = 48$. 10

b) Find a positive root of the equation $2x = 3 + \cos x$ using bisection method correct to 3 decimal places. 6

c) Find the cube root of 24 using Newton-Raphson method. 4



Module - IV

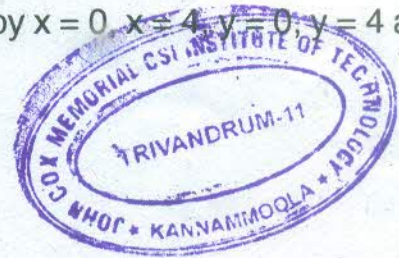
12. a) Use Runge-Kutta fourth order method to calculate $y(0.1)$ and $y(0.2)$. Given

$$\frac{dy}{dx} = \frac{(1+x)y^2}{2}, y(0) = 1. \quad 10$$

b) Solve $\nabla^2 u = 0$ in the square region bounded by $x = 0, x = 4, y = 0, y = 4$ and with the following boundary conditions

$$u(0, y) = 0, u(4, y) = 8 + 2y$$

$$u(x, 0) = \frac{x^2}{2}, u(x, 4) = x^2 \text{ (take } h = k = 1\text{).}$$



10

13. a) Find $y(0.6), y(0.8), y(1)$. Given $\frac{dy}{dx} = x + y, y(0) = 0$ taking $h = 0.2$ using Euler's modified method.

10

b) Use Taylor series method to find $y(0.1)$. Given that $\frac{dy}{dx} = x^2 y - 1, y(0) = 1$.

5

c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule. (Take $n = 6$).

5

