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Reg. No. : .....

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 | 5  | 10 | 15 | 20 | 25 |
| y: | 7 | 11 | 14 | 18 | 24 | 32 |
- using Newton's interpolation formula.
- b) Solve the system of equation by using Gauss elimination method: 7
- $$5x - 9y - 2z + 4w = 7, \quad 3x + y + 4z + 11w = 2, \quad 10x - 7y + 3z + 5w = 6,$$
- $$-6x - 8y - z - 4w = 5$$
- c) Find  $f(9.1)$  using Lagrange interpolation formula. Given 3
- |       |     |     |      |
|-------|-----|-----|------|
| x:    | 8.9 | 9   | 9.3  |
| f(x): | 0.3 | 3.5 | 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

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

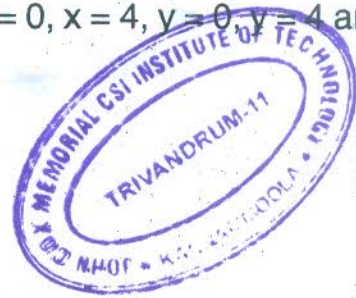
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b) Solve  $\nabla^2 u = 0$  in the square region bounded by  $x = 0, x = 4, y = 0, y = 4$  and with the following boundary conditions

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

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

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

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

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