FOURTH SEMESTER B.TECH DEGREE EXAMINATIONS
(2013 Scheme)
13.401 ENGINEERING MATHEMATICS III (S)

MODEL QUESTION PAPER

Time: **3 Hours** Maximum Marks: **100**

PART –A

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

1. If u and v are harmonic functions, prove that $(u_y - v_x) + i(u_x + v_y)$ is analytic
2. Expand $\frac{1}{z^2}$ as Taylor series about $z = 2$
3. Find the poles and residues of $\frac{1}{z\,sinz}$
4. By means of Lagrange's formula prove that $y_3 = 0.05(y_0 + y_6) - 0.3(y_1 + y_5) + 0.75(y_2 + y_4)$
5. Find the approximate value of $\int_0^1 \frac{1}{1+x^2}dx$ by Trapezoidal rule

PART –B

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

MODULE I

6. **a)** Show that $f(z) = \sqrt{|xy|}$ satisfies CR equations at z=0 but not differentiable at z=0

   b) Find the analytic function $f(z) = u + iv$ if $u - v = (x - y)(x^2 + 4xy + y^2)$

   c) Under the transformation $w = 1/z$, find the image of $|z - 2i| = 2$

7. **a)** If f(z) is a function with continuous second order partial derivatives show that $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 4\frac{\partial^2 f}{\partial z\,\partial \bar{z}}$

   b) Discuss the transformation $w = sinz$.

   c) Find the bilinear mapping that maps $z = i, -i, 1$ in to $w = 0, 1, \infty$ respectively

MODULE II

8. **a)** Find Laurent's series expansion about $z = 0$ for $\frac{z^2-1}{z^2+5z+6}$ in $2 < |z| < 3$

b) Using Cauchy's integral formula, evaluate $\int_C \frac{z}{(z-1)(z-2)^2} dz$ where C is $|z-2| = \frac{1}{2}$

9. **a)** State Cauchy's Residue theorem and hence evaluate $\int_C \frac{dz}{(z^2+4)^2}$

where C is $|z - i| = 2$

b) Evaluate $\int_0^\infty \frac{x^2}{(x^2+a^2)(x^2+b^2)} dx$

MODULE III

10. **a)** Solve $x^3 - 9x + 1 = 0$ for the root lying between 2 and 4 by Regula falsi method

b) Solve by Gauss –Seidel method

$10x + y + z = 12, 2x + 10y + z = 13, 2x + 2y + 10z = 14$

11. **a)** Find by Newton –Raphson method ,the real root of $log_e x - cosx = 0$.

b) The population of a certain town in India are as follows.

Year	: 1921	1931	1941	1951	1961	1971
Population(in lakhs)	: 12	15	20	27	39	52

Estimate the population in the year 1925 and 1965 .

MODULE IV

12. **a)** Using Taylor series method, find y when $x = 1.3$, given that $y' = x^2y - 1$ and $y - 2$ when $x - 1$

b) Use modified Euler's method to find $y(0.1)$ when $\frac{dy}{dx} = x^2 + y$ and $y(0) = 0.94$

c)Evaluate $\int_0^3 \frac{dx}{2x+3}$ by Simpson's rule,dividing into 10 equal parts

13. **a)** Find an approximate value of y when $x = 0.2$ using Runge-Kutta method of order four, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$

b) Solve

$u_{xx} + u_{yy} = (x^2 + y^2)e^{xy}, \quad 0 < x < 1,\ 0 < y < 1,\ ,\ u(0, y) = 1,\ u(1, y) = e^y, 0 \le y \le 1,\ u(x, 0) = 1,\ u(x, 1) = e^x, 0 \le x \le 1$,
with $h = k = \frac{1}{3}$