Roll No.

B.TECH. IIIrd SEMESTER EXAMINATION 2013-14
Engineering Mathematics-III(TMA-301)
CE/EE/ME

Time: 03 Hour   Total Marks: 100

Note: Attempt ALL the questions.

1. Attempt any four: (4x5=20)

   (a) Find out the zeros and discus the nature of the singularities of
   $$f(z) = \frac{z-2}{z^2} \sin\left(\frac{1}{z-1}\right)$$

   (b) Find the missing term in the following table:

x	45	50	55	60	65
y	3	-	2	-	-2.4

   (c) If $w = u + iv$ and $u - v = e^x(\cos y - \sin y)$, find the value of w in terms of z.

   (d) ByNewton-Raphson method, find the value of $(48)^{1/3}$.

   (e)(i) Prove that $1 + \frac{\delta^2}{2} = \sqrt{1 + \delta^2\mu^2}$,

   (ii) Obtain the function whose first difference is $9x^2 + 11x + 5$

   (f) Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |Rf(z)|^2 = 2|f'(z)|^2$

2. Attempt any four: (4x5=20)

   (a) By Cauchy residue theorem solve the integral
   $$\oint_c \frac{3z^2 + 2 + 1}{(z^2-1)(z+3)} dz \quad where \ C : |z| = 2$$

(b) If

$$f(z) = \frac{x^3 y(y - ix)}{x^6 + y^2}, z \neq 0; f(0) = 0$$

then prove that $\frac{f(z) - f(0)}{z} \to 0$ as $z \to 0$ along any radius vector but not as $z \to 0$ in any manner and also that $f(z)$ is not analytic at $z = 0$.

(c) Find the Laurent's expansion for $f(z) = \frac{7z - 2}{z^3 - z^2 - 2z}$, in the region $1 < |z + 1| < 3$

(d) Determine the value of p and q so that rate of convergence of the iterative method $x_{n+1} = px_n + q \frac{N}{x_n^2}$ for computing $N^{1/3}$ becomes as high as possible.

(e) The following table is given:

x	0	1	2	5
y	2	3	12	147

What is the form of the function?

(f) If u is harmonic function then show that $w = u^2$ is not harmonic function unless u is a constant.

3. Attempt any two.   (2x10=20)

   (a) Solve the following system of equations by Gauss-Seidel iterative method: $27x + 6y - z = 85,$

   $$6x + 15y + 2z = 72,$$
   $$x + y = 54z = 110$$

   (b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. It is given that if $\frac{1}{\sqrt{2\pi}} \int_0^t e^{-x^2/2} dx$ then f(0.5)=0.19 and f(1.4)=0.42

   (c) A rod is rotating in a plane. The following table gives the angle θ (in radians) through which the rod has turned for various values of time t (in seconds):

t	0	0.2	0.4	0.6	0.8	1	1.2
θ	0	0.12	0.49	1.12	2.02	3.2	4.67

4. **Attempt any two:** (2x10=20)

(a) A quality control engineer of a tyre company collected the following data. For each of 12 batches of 1000 tyres, he tested 5 tyres and recorded the following results with $\bar{x}$ and R measured in thousands of kilometer:

Batch	1	2	3	4	5	6	7	8	9	10	11	12
$\bar{x}$	51.5	49.7	50	50.7	50.7	50.6	49.8	51.1	50.2	50.4	50.6	50.7
R	1.5	1.6	1.8	0.1	0.9	2.1	0.3	0.8	2.3	1.3	2	2.1

Draw the control chart. Is the production process in control? Explain.

(b) State & prove Simpson's 3/8th rule with the help of quadrature formula and discuss its nature.

(c) Use Runge-Kutta formula of fourth order to find the numerical solution at x=0.8 for the differential equation $y' = \sqrt{x + y}$, $y(0.4) = 0.41$, assume the step length $h = 0.2$

5. **Attempt any two:** (2x10=20)

(a) *Use contour integration to evaluate the real integral*

$$\int_0^\infty \frac{cosmx}{x^2 + a^2} \, dx; (m \geq 0, a > 0)$$

(b) Find the root of the equation $xe^x = cosx$ isthe interval $(0,1)$ using Regula-falsi method correct upto four decimal places.

(c) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible. Variance of x=9. Regression lines 8x-10y+66=0, 40x-18y-214=0, Calculate: (i) The mean value of x and y. (ii) The standard deviation of y and (iii) The coefficient of correction b/w x and y