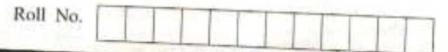
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B.TECH. IIIrd SEMESTER EXAMINATION 2013-14 Engineering Mathematics-III(TMA-301) CE/EE/ME

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	
у	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 $\oint_C \frac{3z^2 + 2 + 1}{(z^2 - 1)(z + 3)} dz \quad \text{where } C: |z| = 2$

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

0 then prove that $\frac{f(z)-f(0)}{z} \rightarrow 0$ as $z \rightarrow$

0 along any radius vector but not as z →

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=u² 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. First 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 rotatin g 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 se conds):

				0.6		1	1.2	
θ	0	0.12	0.49	1.12	2.02	3.2	4.67	

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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
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

$$\int_{0}^{\infty} \frac{\cos mx}{x^2 + a^2} dx; (m \ge 0, a > 0)$$

- (b) Find the root of the equation $xe^x = cosx$ is the 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