

**I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018**  
**MATHEMATICS-II (NM&CV)**  
 (Com to ECE, EIE, ECom E)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answering the question in **Part-A** is Compulsory  
 3. Answer any **FOUR** Questions from **Part-B**

**PART -A**

1. a) Why we apply Numerical methods in finding the roots of the equations? (2M)
- b) Write the relation between  $\delta, E$  (2M)
- c) Evaluate  $\int_0^2 \frac{dx}{1-x}$  using Trapezoidal Rule. (2M)
- d) Is the function  $f(z) = xy + iy$  analytic? (2M)
- e) Write C-R equations in polar form. (2M)
- f) Identify the singularity of  $f(z) = \frac{z+1}{z(z-1)}$  at  $z = 0, z = 1$ . (2M)
- g) Define absolute convergence of the series. (2M)

**PART -B**

2. a) Solve  $e^x = 3x$  by iteration method. (7M)
- b) Solve  $x = \sqrt[3]{15}$  by bisection method. (7M)
3. a) Find  $y(1.3)$  using Newton's Backward difference formula from the table. (7M)

X	1	2	3	4
Y	349	482	591	655

- b) Find  $y(4)$  from the following data. (7M)
 

x	1	5	7	8
y	2	3	12	14
4. a) Find the solution of  $\frac{dy}{dx} = \frac{x-y}{xy}$ ,  $y(1)=1$  at  $x=1.5, 1.6$  using Taylor's series method. (7M)
- b) Find the solution of  $\frac{dy}{dx} = x^2 - y^2$ ,  $y(2.5)=4$  at  $x=3.0, 3.5$  using Modified series method. (7M)
5. a) Find the Harmonic conjugate of  $\log \sqrt{x^2 + y^2}$  (7M)
- b) Find the Orthogonal trajectories of the family of curves  $r^2 \cos 2\theta = c$  (7M)



6. a) Evaluate  $\int_C \frac{z+2}{z} dz$ , where C is (7M)
- (i) Upper half of the circle  $|z|=2$  in the clock wise direction.  
(ii) Lower half of the circle  $|z|=2$  in the anti-clock wise direction.
- b) Represent  $f(z) = \frac{4z+3}{z(z-3)(z+2)}$  in Laurent's series (7M)
- (i)  $|z|=1$       (ii)  $2 < |z| < 3$       (iii)  $|z| > 3$
7. a) Evaluate  $\int_0^{\infty} \frac{x \sin mx}{(16+x^2)} dx$  (7M)
- b) Find the poles and residues of  $f(z) = \frac{1-e^{2z}}{z^4}$  (7M)



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**PART -A**

1. a) What is mean by order of convergence. (2M)
- b) Write the relation between  $\mu, E$  (2M)
- c) Evaluate  $\int_0^5 \frac{dx}{3+x^2}$  using Trapezoidal Rule. (2M)
- d) Define limit and continuity of a complex function  $f(z)$ . (2M)
- e) Prove that  $f(z) = \sin z$  is analytic. (2M)
- f) Given an example for Non – Isolated Singularity. (2M)
- g) State Cauchy's integral theorem. (2M)

**PART -B**

2. a) Solve  $e^{-x} = 10x$  by Newton Raphson method. (7M)
- b) Solve  $\frac{1}{x} = \sin x$  by False position method. (7M)
3. a) Find  $y(38)$  using Gauss Backward difference formula from the table. (7M)

X	30	35	40	45	50
Y	15.9	14.9	14.1	13.3	12.5

- b) Find the  $y(3)$  from the following data. (7M)

x	0	1	2	6
y	2	3	12	147

4. a) Find the solution of  $\frac{dy}{dx} = x - y$ ,  $y(0)=1$  at  $x=0.1, 0.2$  using Picard's method. (7M)
- b) Find the solution of  $\frac{dy}{dx} = x^2 - y$ ,  $y(0)=1$  at  $x=0.1, 0.2$  using RK method of fourth order. (7M)
5. a) Find the analytic function  $f(z) = u + iv$  where  $v(x, y) = e^{-x}(x \cos y + y \sin y)$  (7M)
- b) Find the Orthogonal trajectories of the family of curves  $x^4 - 6x^2y^2 + y^4 = c$  (7M)



6. a) Evaluate  $\int_C |z|^2 dz$  around the square with vertices  $(0,0), (1,0), (1,1), (0,1)$ , taken (7M)  
in positive sense.
- b) Expand  $f(z) = \frac{e^{2z}}{(z-1)^2}$  about  $z = 1$  (7M)
7. a) Evaluate  $\oint_C \frac{z-3}{z^2+2z+5}$  where C is the circle (7M)  
i)  $|z+1-i| = 2$ ,                      ii)  $|z+1+i| = 2$   
using residue theorem.
- b) Show by the method of Contour integration Evaluate  $\int_0^{\infty} \frac{\cos mx}{(a^2+x^2)} dx$  (7M)



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**PART -A**

1. a) Write the formula to calculate the second approximation in False position method. (2M)
- b) Prove that  $\Delta \nabla = \Delta - \nabla$  (2M)
- c) Evaluate  $\int_0^4 \frac{dx}{3+x^4}$  using Trapezoidal Rule. (2M)
- d) Find  $\lim_{z \rightarrow 0} \frac{z^2}{|z|}$  (2M)
- e) Find  $a$  and  $b$  if  $f(z) = (x^2 - 2xy + ay^2) + i(bx^2 - y^2 + 2xy)$  is analytic. (2M)
- f) Evaluate  $\int_{(1,1)}^{(2,8)} (x^2 + ixy) dz$  along by curve  $x = t, y = t^3$  (2M)
- g) Find the Residue of  $f(z) = \operatorname{cosec} z$  at  $z = 0$ . (2M)

**PART -B**

2. a) Solve  $3x + \sin x - e^x = 0$  by Bisection method. (7M)
- b) Solve  $\log x - \cos x = 0$  by Newton Raphson method. (7M)
3. a) Find  $f(2.5)$  if  $f(1.7) = 5.4, f(1.8) = 6.0, f(1.9) = 6.86, f(2) = 7.89$ . (7M)
- b) Evaluate  $y(7)$  from the following table. (7M)

X	1	2	4	5	7
Y	2	4	6	8	10

4. a) Find the solution of  $\frac{dy}{dx} = x + \sqrt{y}, y(1) = 1$  at  $x = 1.1, 1.2$  using RK method of fourth order (7M)
- b) Evaluate  $\int_0^1 e^{\tan x} dx$  using (i) Simpson's 1/3<sup>rd</sup> Rule (ii) Simpson's 3/8<sup>th</sup> Rule (7M)
5. a) Show that  $f(z) = \begin{cases} \frac{xy^2(x+iy)}{x^2+y^4} & \text{if } z \neq 0 \\ 0 & \text{if } z = 0 \end{cases}$  (7M)

satisfies C-R equations at the origin but  $f^1(z)$  does not exist



- b) Find analytic function  $f(z)$  given that  $u + v = \frac{2\sin 2x}{e^{2y} + e^{-2y} - 2\cos 2x}$  (7M)
6. a) Evaluate  $\oint_c (z + 1)dz$  where  $c$  is the boundary of the square whose vertices are at the points  $z=0, z=1, z=1+i, z=i$  (7M)
- b) Find Laurent's series  $f(z) = \frac{1}{(z+2)(z^2+1)}$  in (7M)
- (i)  $|z| < 1$       (ii)  $1 < |z| < 2$       (iii)  $|z| > 2$
7. a) Find the poles and residues of  $f(z) = \frac{z^2}{(z-1)^2(z+2)}$  (7M)
- b) Evaluate by Contour integration  $\int_0^{\infty} \frac{dx}{a^2 + x^2}$  (7M)



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**PART -A**

1. a) Write the iterative formula to find  $\sqrt{10}$  using Newton Raphson method. (2M)
- b) Find  $\Delta^2(\sin x)$  if  $h = 1$ . (2M)
- c) What is RK method of first order? (2M)
- d) Check analyticity by using C-R equations for  $f(z) = e^x(\cos y + i \sin y)$  (2M)
- e) Evaluate  $\int_0^{1+i}(x^2 - iy)dz$  along the paths  $y = x^2$ . (2M)
- f) State generalized Cauchy's integral formula. (2M)
- g) Find the residue of  $f(z) = \frac{1}{z^3}$  at  $z = 0$ . (2M)

**PART -B**

2. a) Solve  $x = \sqrt{28}$  by False position method. (7M)
- b) Solve  $3x - \log x_{10} = 6$  by Iteration method. (7M)
3. a) Fit  $y(0.5)$  from the following data. (7M)

x	-1	0	1	2
y	1	5	7	12

- b) Find  $y(4)$  for the following data (7M)
- |   |    |    |    |    |
|---|----|----|----|----|
| x | 0  | 1  | 3  | 5  |
| y | 70 | 81 | 86 | 96 |
4. a) Find the solution of  $\frac{dy}{dx} = x + ye^x$ ,  $y(2)=1$  at  $x=2.5, 3.0$  using modified Euler's method. (7M)

- b) Evaluate  $\int_0^{\pi} \frac{dx}{1+x^2}$  using (i) Simpson's 1/3<sup>rd</sup> Rule (ii) Simpson's 3/8<sup>th</sup> Rule. (7M)
5. a) If  $f(z)$  is an analytic function show that  $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$  (7M)
- b) If  $f(z)$  is an analytic function with constant modulus then  $f(z)$  is constant. (7M)



6. a) Find the Laurent's series of  $f(z) = \frac{z}{(z^2-1)(z^2+4)}$  for (7M)  
(i)  $|z| < 1$  (ii)  $1 < |z| < 2$  (iii)  $|z| > 2$
- b) Evaluate  $\int_C \frac{e^z}{(z^2+\pi^2)^2} dz$  where  $C: |z| = 4$ . (7M)
7. a) Evaluate  $\oint_C \frac{dz}{z \sin z}$ , where  $C$  is the Circle  $|z| = 1$  using residue theorem. (7M)
- b) Evaluate  $\int_0^\pi \frac{d\theta}{3+2 \cos \theta}$  by the method of Residues. (7M)

