Code No: R161110 **R16** SET - 1

I B. Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2017
MATHEMATICS-II (NM&CV)
(Com. to ECE, EIE, E Com E)

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) Define algebraic equation with suitable example. (2M)

b) Define shift operator. (2M)

c) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Trapezoidal Rule. (2M)

d) Show that $f(z) = xy + iy$ is everywhere continuous. (2M)

e) Define Harmonic function with an example. (2M)

f) Identify the singularity of $f(z) = \frac{sinz}{z}$ at z = 0 . (2M)

g) Evaluate $\int_0^{3+i} z^2 dz\ along\ the\ line\ y = \frac{x}{3}$. (2M)

PART -B

2. a) Solve $2x-\log_{10}x = 7$ by iteration method. (7M)

b) Solve $x^3-x+11=0$ by bisection method. (7M)

3. a) Find y(2.4) using Newton's Backward difference formula from the table. (7M)

X	1	1.4	1.8	2.2
Y	3.49	4.82	5.91	6.5

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

x	0	1	2	5
y	2	3	12	147

4. a) Find the solution of $\frac{dy}{dx} = x - y$, y(0)=1at x=0.1,0.2 using Taylor's series method. (7M)

b) Find the solution of $\frac{dy}{dx} = x^2 - y$, y(0)=1at x=0.1,0.2 using Modified series method. (7M)
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5. a) Prove that $f(z) = |z|^2$ is differentiable only at origin. (7M)

   b) Check $U(x, y) = e^{-x}(x \sin y - y \cos y)$ is harmonic or not. If harmonic find its conjugate. (7M)

6. a) If $f(a) = \int_c \frac{4z^2+z+5}{z-a} dz$ where c is the ellipse $x = 2\cos\theta$, $y = 3\sin\theta$ find the values of (a) f(3.5) (b) f(i). (7M)

   b) Expand $\frac{\sin z}{z-\pi}$ at $z = \pi$ as a Taylor's series. (7M)

7. a) Evaluate $\int_0^\infty \frac{x \sin mx}{(16+x^4)} dx$ (7M)

   b) Evaluate $\oint_C \frac{2e^z}{z(z-3)}$ dz Where c : |z| = 2 by Residue theorem (7M)

Code No: R161110 **R16** SET - 2

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PART –A

1. a) Define Transcendental equation with suitable example. (2M)

b) Define average operator. (2M)

c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal Rule. (2M)

d) Show that the function f(z)=z is continuous. (2M)

e) Prove that $f(z)=z^2$ is analytic. (2M)

f) Identify the singularity of $f(z) = e^{1/z}$ at z = 0. (2M)

g) Evaluate $\int_{(0,0)}^{(1,1)}[3x^2+5y+i(x^2-y^2)]dz$ along $y^2=x$. (2M)

PART -B

2. a) Solve $2x-\log_{10}x = 7$ by Newton Raphson method. (7M)

b) Solve $x^3-x+11=0$ by False position method. (7M)

3. a) Find y(1.5) using Gauss Backward difference formula from the table. (7M)

X	1	1.4	1.8	2.2
Y	3.49	4.82	5.91	6.5

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)

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5. a) If $f(z)=u(r,\theta)+iv(r,\theta)$ is differentiable at $z=re^{i\theta}\neq 0$ then prove that (7M)

$$\frac{\partial u}{\partial r}=\frac{1}{r}\frac{\partial v}{\partial \theta},\frac{\partial v}{\partial r}=-\frac{1}{r}\frac{\partial u}{\partial \theta}$$

b) Show that $u(x,y)=e^{-2xy}\sin(x^2-y^2)$ is harmonic, find its conjugate. (7M)

6. a) Evaluate $\int_c \frac{z^2-z+1}{z-1}dz$ where c is (i) |z| =1 (ii) |z| = ½ using Cauchy's integral formula. (7M)

b) Expand f(z) $=\frac{1}{z^2-3z+2}$ *in* the region (7M)

(i) $0<|z+1|<1$ (ii) $1<|z|<2$

7. a) Evaluate $\oint_c \frac{dz}{Sinh\ z}$, where C is the Circle |z| = 4. using residue theorem. (7M)

b) Show by the method of Contour integration that (7M)

$$\int_0^\infty \frac{\cos mx}{\left(a^2+x^2\right)^2}dx=\frac{\pi}{4a^3}(l+ma)e^{imx}(a>0)$$

Code No: R161110 **R16** SET - 3

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2. Answer **ALL** the question in **Part-A**
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PART –A

1. a) Define quadratic convergence. (2M)

b) Prove that $\Delta\nabla = \nabla\Delta$ (2M)

c) Write the merits of Euler's method. (2M)

d) Find $\underset{z\to 0}{Lt}\dfrac{x^2 y}{x^4+y^2}$ (2M)

e) Show that $f(z)=\bar{z}$ is now here analytic. (2M)

f) Evaluate $\int_0^{1+i}(x^2-iy)dx$ along the paths y = x. (2M)

g) Find the Residue of f(z) = $\frac{Sin\, z}{z\, Cos\, z}$ at z = 0. (2M)

PART -B

2. a) Solve $xe^x = 2$ by Bisection method. (7M)

b) Solve x^3-5x+1=0 by Newton Raphson method. (7M)

3. a) Find f(1.75) if f(1.7) = 5.474, f(1.8) = 6.050, f(1.9) = 6.686, f(2) = 7.389 (7M)

b) Evaluate y(7) from the following table. (7M)

X	1	3	5	6	8
Y	2	1.5	2.4	4	5.6

4. a) Find the solution of $\frac{dy}{dx}=x-y$, y(0)=1at x=0.1,0.2 using RK method of fourth order (7M)

b) Evaluate $\int_0^1 \frac{dx}{1+x^4}$ using (i) Simpson's 1/3rd Rule (i) Simpson's 3/8th Rule (7M)

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5. a) Show that $f(z)=\begin{cases}\frac{(x^3+y^3)+i(x^3+y^3)}{x^2+y^2}, & z\neq 0\\ 0, & z=0\end{cases}$ is not analytic at z = 0 although the C-R equations are satisfied at the origin. (7M)

b) Determine analytic function whose real part $u=e^{x^2-y^2}\cos 2xy$ (7M)

6. a) Using Cauchy's Integral formula evaluate (7M)

$$\int_c \frac{z^4}{(z+1)(z-i)^2}dz \text{ where c is the ellipse } 9x^2+4y^2=36$$

b) Find the Laurent's series of $f(z)=\frac{1}{z^2-4z+3}$ for (7M)

$(i) 1<|z|<3$ (ii) $|z|>3$

7. a) Evaluate $\oint_C e^{\frac{-1}{z}} \sin\frac{1}{z}dz$ where C: |z| = 1 using Cauchy's residue theorem. (7M)

b) Evaluate by Contour integration $\int_0^\infty \frac{dx}{1+x^2}$ (7M)

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PART –A

1. a) Define order of convergence. (2M)

b) Find $\Delta^2(x^2)$ if h = 1. (2M)

c) Write the working procedure to solve the ODE by second order RK method. (2M)

d) Find $\underset{z\to 1}{Lt}\dfrac{x^2-y^2}{x^2+y^2}$ (2M)

e) Evaluate $\int_0^{1+i}(x^2+iy)dz$ along the paths y = x. (2M)

f) If C is a simple closed curve then Evaluate $\int_C (sin\,3z+z^4+e^z)dz$. (2M)

g) Find the Residue of. f(z) = $\frac{e^{z^2}}{z^3}$ at z = 0. (2M)

PART -B

2. a) Solve $xe^x = 2$ by False position method. (7M)

b) Solve x^3-5x+1=0 by Iteration method. (7M)

3. a) Fit a y(0.5) from the following data. (7M)

x	-1	0	1	2
y	10	5	8	10

b) Find the y(4) for the following data. (7M)

x	0	2	3	6
y	707	819	866	966

4. a) Find the solution of $\dfrac{dy}{dx}=x-y$, y(0)=1at x=0.1,0.2 using modified Euler's method. (7M)

b) Evaluate $\int_0^1\dfrac{dx}{1+x^3}$ using (i) Simpson's 1/3rd Rule (i) Simpson's 3/8th Rule. (7M)
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5. a) Find analytic function whose Real part $u(x,y) = x^3 - 3xy^2 + 3x^2 - 3y^2 + 2x + 1$ (7M)

b) If $f(z)$ is an analytic function show that (7M)

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\left|\operatorname{Re} f(z)\right|^2 = 2\left|f^1(z)\right|^2$$

6. a) Obtain the Taylor's series expansion $f(z) = \frac{2z^3+1}{z^2+z}$ about z = i. (7M)

b) Evaluate $\oint_c \frac{\cos\pi z}{z^2-1} dz$ along the rectangle with vertices $2 \pm i, -2 \pm i$. (7M)

7. a) Evaluate $\oint_C \frac{Coth\, z}{z-1}$ dz Where c : |z| = 2 using Cauchy's residue theorem. (7M)

b) Show that by the method of Residues $\int_0^{\pi} \frac{d\theta}{a + b\cos\theta} = \frac{\pi}{\sqrt{a^2 - b^2}} (a > b > 0)$ (7M)