Code No: R161202 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
MATHEMATICS-II (MM)
(Com. to CE,EEE,ME,AE,AME,Bio-Tech,Chem E,Metal E,Min E,PCE,PE)

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) Define algebraic equation with one example. (2M)
   b) Write a formula for the half range cosine series of f(x) in [0,L]. (2M)
   c) Write the change of scale property of Fourier Transform. (2M)
   d) Prove that $\frac{\Delta}{\nabla}-\frac{\nabla}{\Delta}=[\Delta+\nabla]$ (2M)
   e) Find y(1.2) given that by Euler's method $\frac{dy}{dx}=x+y,\ y(1)=1$ by Euler's method. (2M)
   f) Write a formula for Simpson's $3/8^{th}$ Rule. (2M)
   g) Write one dimensional wave equation. (2M)

PART -B

2. a) Find the Real root of $e^x \sin x = 2$ using False position method. (7M)
   b) Find the Real root of $x^3-x-1=0$ using Iteration method. (7M)

3. a) Find the Lagrange's polynomial for the following data. (7M)

x	0	1	2	4
y	2	3	12	14

   b) Find y(0.5) from the following data. (7M)

x	-1	0	1	2
y	10	5	8	10

4. a) Find the Fourier series of $f(x)=\begin{cases}x+\pi & -\pi < x < 0\\ -x-\pi & 0 < x < \pi\end{cases}$ (7M)
   b) Find the Half range sine series of $f(x)=\begin{cases}\frac{1}{4}-x & 0<x<\frac{1}{2}\\ x-\frac{3}{4} & \frac{1}{2}<x<1\end{cases}$ (7M)

5. a) Find the Finite Fourier sine transform of $f(x)$ defined by (7M)
$$f(x)=\begin{cases}x & 0<x<\frac{\pi}{2}\\ \pi-x & \frac{\pi}{2}<x<\pi\end{cases}$$

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b) Find the Fourier transform of $f(x)$ defined by $f(x)=\begin{cases} x & if\ 0<x<1 \\ 1-x & if\ 1<x<2 \\ 0 & if\ x>2 \end{cases}$ (7M)

6. a) Solve the PDE $3\frac{\partial u}{\partial x}+2\frac{\partial u}{\partial y}=0$ and $u(x,y)=4e^{-x}$ (7M)

b) Solve the wave equation $\frac{\partial^2 y}{\partial x^2}=c^2\frac{\partial^2 y}{\partial t^2}$ (7M)

Subject to

(i) $y(0,t)=0$

(ii) $y(\pi,t)=0$

(iii) $y(x,0)=x, 0\le x\le\pi$

(iv) $\frac{\partial y}{\partial t}(x,0)=0, 0\le x\le\pi$

7. a) Evaluate $\int_0^{\pi}\sin x dx$ using (i) Trapezoidal Rule (ii) Simpson's 1/3rd rule. (7M)

b) Using RK method of second order find y(0.1) ,y(0.2) given that (7M) $\frac{dy}{dx}=2y+e^x, y(0)=0$

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PART –A

1. a) Find the interval of the existence of the root of the equation tanx = x. (2M)
   b) Write a formula for the half range sine series of f(x) in [0,π]. (2M)
   c) Write the shifting theorem in Fourier Transform. (2M)
   d) Prove that $\nabla = 1 - E^{-1}$ (2M)
   e) Find y(1.1) given that by Euler's method $\frac{dy}{dx} = xy,\ y(1) = 1$ (2M)
   f) Write a formula for Simpson's 1/3rd Rule. (2M)
   g) Write Laplace equation. (2M)

PART -B

2. a) Find the Real root of $e^x \sin x = 1$ using Bisection method. (7M)
   b) Evaluate $1/\sqrt{12}$ using 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(4) from the following table. (7M)

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

4. a) Find the Fourier series of $f(x) = |\sin x| \quad in \ (-\pi, \pi)$ (7M)
   b) Find the Half range cosine series of $f(x) = \begin{cases} \frac{1}{4} - x & 0 < x < \frac{1}{2} \\ x - \frac{3}{4} & \frac{1}{2} < x < 1 \end{cases}$ (7M)
5. a) Find the Finite Fourier Cosine transform of $f(x)$ defined by $f(x) = \begin{cases} x & 0 < x < 1 \\ 1 - x & 1 < x < 2 \end{cases}$ (7M)
   b) Find the Fourier transform of $f(x)$ defined by $f(x) = \begin{cases} \frac{\sqrt{2\pi}}{2a} & if\ |x| < a \\ 0 & if\ |x| > a \end{cases}$ (7M)

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6. a) Solve $4\frac{\partial \mu}{\partial x}+\frac{\partial \mu}{\partial y}=3\mu$ and $u(0,y)=e^{-5y}$ (7M)

   b) A Homogenous rod of conducting material of length 50 cm has its ends kept at zero temperature and the temperature initially is (7M)
   $u(x,0)=x$ *if* $0<x<50$

7. a) Evaluate $\int_{0.6}^{2}\frac{1}{1+x}dx$ using (i) Trapezoidal Rule (ii) Simpson's 3/8th rule. (7M)

   b) Using Taylors series method find y(0.1) ,y(0.2) given that $\frac{dy}{dx}=2y+3e^{x}, y(0)=1$ (7M)

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PART –A

1. a) Write two approximations of cosx = x using iteration method. (2M)

   b) Find Co-efficient of fourier series a_n for $f(x) = e^{2x}$ in $[0,\pi]$. (2M)

   c) Find the Fourier sine Transform $f(x) = e^{-x}$ in $(0,\infty)$. (2M)

   d) Find $\Delta\big(f(x)g(x)\big)$ (2M)

   e) Find y(0.2) given that by Euler's method $\frac{dy}{dx} = \frac{x+y}{2}$, $y(0) = 1$ by Euler's method. (2M)

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

   g) Write one dimensional heat equation. (2M)

PART -B

2. a) Find the Real root of $xe^x = \cos x$ using False position method. (7M)

   b) Find the Real root of $x^3 - x - 2 = 0$ using Bisection method. (7M)

3. a) Find the Lagrange's polynomial for the following data. (7M)

x	1	2	4	5
y	2	3	2	4

   b) Find y(1.5) from the following data using Gauss Forward interpolation formula. (7M)

x	0	1	2	3
y	10	5	8	10

4. a) Find the Fourier series of $f(x) = \begin{cases} x+1 & -1 < x < 0 \\ -x-1 & 0 < x < 1 \end{cases}$ (7M)

   b) Find the Half range sine series of $f(x) = \begin{cases} \frac{1}{2} - x & 0 < x < \frac{1}{2} \\ x - \frac{2}{3} & \frac{1}{2} < x < 1 \end{cases}$ (7M)

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5. a) Find the Finite Fourier cosine transform of $f(x)$ defined by (7M)
$$f(x)=\begin{cases} x & 0<x<1 \\ 1-x & 1<x<2 \end{cases}$$

b) Find the Fourier transform of $f(x)$ defined by $f(x)=\begin{cases} x & if\ 0<x<\frac{\pi}{2} \\ \pi-x & if\ \frac{\pi}{2}<x<\pi \\ 0 & if\ x>\pi \end{cases}$ (7M)

6. a) Solve the PDE $\frac{\partial u}{\partial x}-2\frac{\partial u}{\partial y}=u$ and $u(x,0)=3e^{-5x}+2e^{-3x}$ (7M)

b) Find the temperature in a bar of length 2 whose ends are kept at zero with initial temperature is $sin\frac{\pi x}{2}+3\,sin\frac{5\pi x}{2}$ (7M)

7. a) Evaluate $\int_1^2 \frac{\sin x}{x}dx$ using (i) Trapezoidal Rule (ii) Simpson's 1/3rd rule. (7M)

b) Using RK method of Fourth order find y(0.1) ,y(0.2) given that $\frac{dy}{dx}=x^2-y, y(0)=1$ (7M)

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PART –A

1. a) Find the two approximations of equation tanx = x bisection method. (2M)
   b) Write the half range sine series of f(x) = 1 in [0,π] (2M)
   c) Write the Modulation theorem in Fourier Transform. (2M)
   d) Find $\Delta\left(\frac{f(x)}{g(x)}\right)$ (2M)
   e) Find y(1.5) given that by Euler's method $\frac{dy}{dx} = x + y^2,\ y(0) = 1$ (2M)
   f) Find $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal Rule. (2M)
   g) Write one possible solution of Wave equation. (2M)

PART -B

2. a) Find the Real root of $e^x - 3x = 0$ using False position method. (7M)
   b) Evaluate $x + \log x_{10} - 2 = 0$ using Newton Raphson method. (7M)

3. a) Find f(1.85) if f(1.7) = 5.474 , f(1.8) = 6.050 , f(1.9) = 6.686 , f(2) = 7.389 using Gauss Backward interpolation formula. (7M)
   b) Evaluate y(x) from the following table. (7M)

x	0	1	3	4
y	-12	0	12	24

4. a) Find the Fourier series of $f(x) = |x| \quad in \quad (-\pi, \pi)$ (7M)
   b) Find the Half range cosine series of $f(x) = \begin{cases} x & 0 < x < \frac{1}{2} \\ -x & \frac{1}{2} < x < 1 \end{cases}$ (7M)

5. a) Find the Finite Fourier Cosine transform of $f(x)$ defined by (7M)
$$f(x) = \begin{cases} x & 0 < x < \frac{1}{2} \\ \frac{1}{2} - x & \frac{1}{2} < x < 1 \end{cases}$$

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b) Find the Fourier transform of $f(x)$ defined by $f(x)=\begin{cases}1-x^2 & if\ |x|<1\\ 0 & if\ |x|>1\end{cases}$ (7M)

6. a) Solve $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ given that $u(0,y)=3e^{-y}-e^{-5y}$ (7M)

b) A rod of 100cm long with insulated sides kept temperature at 0^0 C and 100^0 C until steady state prevail two ends are suddenly insulated and kept so. Find the temperature distribution in the rod. (7M)

7. a) Evaluate $\int_0^{\pi}\frac{2}{1+x}dx$ using (i) Trapezoidal Rule (ii) Simpson's 3/8th rule. (7M)

b) Using Picard's method find y(0.1) ,y(0.2) given that $\frac{dx}{dy}=2x-y, y(0)=3.$ (7M)

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