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

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2018
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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Write the iteration formula to find $\sqrt{N}$ using Newton Raphson method. (2M)

b) Prove that $\mu\delta = \frac{1}{2}[\Delta + \nabla]$ (2M)

c) Write the formula for RK method of second order. (2M)

d) Write Simpson's $1/3^{rd}$ Rule. (2M)

e) Find the value of a_0 for $f(x) = \begin{cases} 1 & 0 < x < \frac{\pi}{2} \\ -1 & \frac{\pi}{2} < x < \pi \end{cases}$ (2M)

f) State Linear property in Fourier Transform. (2M)

g) Write the equation for the PDE $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ by variable separable method. (2M)

PART -B

2. a) Find the root of the equation x^3-6x-4=0 using iteration method. (7M)

b) Find the root of the equation 2x-$\log_{10}$ x=7 using False position method. (7M)

3. a) Find the parabola passing through the points (0,1), (1,3) and (3,55) using Lagrange's interpolation formula. (7M)

b) Area A of circle and diameter d is given for the following values (7M)

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

Calculate the area of circle of diameter 105.
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4. a) Evaluate y (0.1) using RK method of fourth order for $\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0)=1$ (7M)

b) Evaluate y (0.1) ,y(0.2) using Picard's method for $\frac{dy}{dx} = x + y$, $y(0)=1$ (7M)

5. a) Find the Fourier series of $f(x) = \begin{cases} 1+\frac{2x}{\pi} & if \ -\pi \le x < 0 \\ 1-\frac{2x}{\pi} & if \ 0 \le x < \pi \end{cases}$ (7M)

Hence deduce that $1+\frac{1}{3^2}+\frac{1}{5^2}+......=\frac{\pi^2}{8}$

b) Find the Half range sine series of f(x) = x^2 in [0,2] (7M)

6. a) Using Fourier integral, Show that $\int_0^\infty \frac{\cos\lambda x + \lambda \sin\lambda x}{1+\lambda^2} d\lambda = \begin{cases} 0 & if \ \ x<0 \\ \pi e^{-x} \ if & x>0 \end{cases}$ (7M)

b) Find the Fourier cosine transform of $\frac{1}{1+x^2}$ and hence deduce Fourier sine transform $\frac{x}{1+x^2}$ (7M)

7. a) Solve the PDE $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$ where $u(0,x) = 8e^{-3y}$ (7M)

b) A tightly stretched string with fixed end points at x = 0 and x = 1 is initially in a position given by (7M)

$$f(x) = \begin{cases} x & 0 < x < \frac{1}{2} \\ 1-x & \frac{1}{2} < x < 1 \end{cases}$$

If it is released from this position with velocity zero find the displacement u(x, t) at any point of *x* of the string at any time is t > 0.

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PART –A

1. a) Find two iterations of x = cosx using bisection method. (2M)

b) Prove that $\Delta \log f(x) = \log\left[1+\frac{\Delta f(x)}{f(x)}\right]$ (2M)

c) Write Trapezoidal Rule. (2M)

d) Write the Dirichlet conditions for Fourier series. (2M)

e) Find the value of a_n for $f(x)=\begin{cases} 1 & 0<x<\frac{1}{2} \\ -1 & \frac{1}{2}<x<1 \end{cases}$ (2M)

f) State modulation property in Fourier transforms. (2M)

g) Write two dimensional steady state equation. (2M)

PART -B

2. a) Find the root of the equation x e^x= 2 using Newton Raphson method. (7M)

b) Find the root of the equation 3x = 1+cosx using False position method. (7M)

3. a) Find the Lagrange’s polynomial for the following data, hence find y(15). (7M)

x	-5	6	9	11
y	12	13	14	16

b) Find y(23) for the following data using Gauss Forward interpolation formula. (7M)

x	10	20	30	40	50
y	9.21	17.54	31.82	55.32	92.51

4. a) Evaluate y (0.1) using RK method of fourth order for $\frac{dy}{dx}=y+xe^x$, $y(0)=1$ (7M)

b) Evaluate y (0.1) using Taylor’s method for $\frac{dy}{dx}=x+y^2$, $y(0)=1$ (7M)

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5. a) Find the Fourier series of f(x) = sinhax in $-\pi<x<\pi$ (7M)

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

6. a) Using Fourier cosine integral, show that $\frac{\pi}{2}e^{-x}=\int_0^\infty \frac{\cos\lambda x}{\lambda^2+1}d\lambda$ (7M)

b) Find the Fourier sine transform of the function f(x) = x in $(0,\infty)$ (7M)

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

b) Find the temperature u(x, t) in a homogenous bar of heat conducting method of length 'l' whose ends are kept at 0^0c and whose initial temperature is $\frac{ax}{l^2}(l-x)$ (7M)

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PART –A

1. a) Find two iterations of x $e^x = 2$ using False position method. (2M)

b) Show that $\nabla = 1 - E^{-1}$ (2M)

c) Evaluate y (0.1) by Euler's method for $\frac{dy}{dx} = \frac{x+y}{y-x},\ y(0)=1$. (2M)

d) Write Simpson's 3/8th Rule. (2M)

e) Find the value of b_n for $f(x) = \begin{cases} 1 & 0 < x < \frac{\pi}{2} \\ -1 & \frac{\pi}{2} < x < \pi \end{cases}$ (2M)

f) Write shifting theorem in Fourier transforms. (2M)

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

PART -B

2. a) Find the root of the equation $x^4 - 10 = x$ using Bisection method. (7M)

b) Find the root of the equation xtanx+1=0 using Newton Raphson method. (7M)

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

x	0	2	3	6
y	648	704	729	792

b) Fit a y(0.5) the following data using Newton Forward interpolation formula. (7M)

x	-1	0	1	2
y	10	5	8	10

4. a) Evaluate $\int_0^2 \frac{1}{1+x}dx$ by taking h = 0.1 by (7M)

(i) Trapezoidal rule.

(ii) Simpson's 1/3 rd rule

b) Evaluate y (0.1) using Modified Euler's method for $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ (7M)
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5. a) Find the Half range cosine of $f(x)=\begin{cases} kx & 0<x<\dfrac{\pi}{2} \\ k(\pi-x) & \dfrac{\pi}{2}<x<\pi \end{cases}$ (7M)

b) Find the Fourier series of $f(x)=\dfrac{\pi-x}{2}\ \ in\ \ 0<x<2$ (7M)

6. a) Express the $f(x)$ defend by $f(x)=\begin{cases} 1 & if\ |x|<1 \\ 0 & if\ |x|>1 \end{cases}$ as a Fourier integral (7M)

Hence Evaluate $\int\limits_0^{\infty} \dfrac{\sin\lambda\cos\lambda x}{\lambda} d\lambda$

b) Find Fourier transform of $f(x)=e^{-x^2}, -\infty<x<\infty$ hence evaluate (7M)

(i) $F\left(e^{-\frac{x^2}{3}}\right)$ (ii) $F\left(e^{-4(x-3)^2}\right)$

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

b) A rectangular plate with insulated surface is 8 cm wide. If the temperature along one short edge y = 8 cm. is given by $100\sin\dfrac{\pi x}{8}$, 0 < x < 8 while the two long edges x = 0 and x = 8 and other edge are kept 0^0c. Find the steady state temperature at any point on the plane (7M)

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

1. a) Find two iterations of x = sinx using iteration method. (2M)

b) Find $\Delta\left(\tan^{-1}\left(\frac{n-1}{n}\right)\right)$ by taking h=1 (2M)

c) Evaluate y (0.1) by Euler's method for $\frac{dy}{dx}=x+y,\ y(0)=1$. (2M)

d) Write half range sine series for f(x) = 1 in [0,2] (2M)

e) Find the value of a_n for $f(x)=\begin{cases}1 & 0<x<\frac{1}{2}\\ -1 & \frac{1}{2}<x<1\end{cases}$ (2M)

f) Write Finite Fourier cosine transform for f(x) (2M)

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

PART -B

2. a) Find the root of the equation x^3-8x- 4 = 0 using Newton raphson method. (7M)

b) Find the root of the equation 4sinx = e^x using False position method. (7M)

3. a) Find y(10) for the data (7M)
y(3)=2.7,y(4)=6.4,y(5)=12.5,y(6)=21.6,y(7)=34.3,y(8)=51.2,y(9) = 72.9

b) Evaluate y(2) from the following table. (7M)

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

4. a) Evaluate $\int_0^1 \sqrt{1+x^4}\,dx$ by taking h = 0.125 by (7M)
(i) Simpson's 1/3rd rule (ii) Simpson's 3/8th rule

b) Evaluate y (0.1) using Taylor's for $\frac{dy}{dx}=x^2-y^2$, $y(0)=1$ (7M)
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5. a) Find the Fourier series for $f(x)=\begin{cases}-\pi, & -\pi<x<0\\ x, & 0<x<\pi\\ \dfrac{-\pi}{2}, & x=0\end{cases}$ (7M)

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots=\frac{\pi^2}{8}$

b) Find the Half range cosine series of $f(x) = e^x$ in $[0,1]$ (7M)

6. a) Using Fourier integral, Show that $\int_0^\infty \frac{\sin \pi\lambda}{1-\lambda^2}\sin \lambda x d\lambda = \begin{cases}\frac{1}{2}\pi\sin x & \text{if } 0<x<\pi\\ 0 & \text{if } x>\pi\end{cases}$ (7M)

b) Find the Fourier cosine transform of x^{n-1} (7M)

7. a) Solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$, where $u(x,0)=6e^{-3x}$ by the method of separation of variables. (7M)

b) A bar of 50cm long with insulated sides kept at 0^0 C and that the other end is kept at 100^0 C until steady state conditions prevail. The two ends are suddenly insulated so that the temperature is zero at each end thereafter. Find the temperature distribution. (7M)