

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**

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 $3/8^{\text{th}}$ 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)

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

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

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

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

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



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PART -A

1. a) Find the interval of the existence of the root of the equation $\tan x = x$. (2M)
- b) Write a formula for the half range sine series of $f(x)$ in $[0, \pi]$. (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 $1/3^{\text{rd}}$ 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 $f(x) = |\sin x|$ 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 (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 $f(x) = \begin{cases} \frac{\sqrt{2\pi}}{2a} & \text{if } |x| < a \\ 0 & \text{if } |x| > a \end{cases}$ (7M)

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 $u(x, 0) = x$ if $0 < x < 50$ (7M)
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 Taylor's 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 $\cos x = x$ 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 $\Delta(f(x)g(x))$ (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.

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)

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 $f(x) = \begin{cases} x & \text{if } 0 < x < \frac{\pi}{2} \\ \pi - x & \text{if } \frac{\pi}{2} < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$ (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 (7M)

temperature is $\sin \frac{\pi x}{2} + 3 \sin \frac{5\pi x}{2}$

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 (7M)
- $$\frac{dy}{dx} = x^2 - y, y(0) = 1$$

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PART -A

1. a) Find the two approximations of equation $\tan x = x$ bisection method. (2M)
- b) Write the half range sine series of $f(x) = 1$ in $[0, \pi]$ (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 $f(x) = |x|$ in $(-\pi, \pi)$ (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)

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

b) Find the Fourier transform of $f(x)$ defined by $f(x) = \begin{cases} 1-x^2 & \text{if } |x| < 1 \\ 0 & \text{if } |x| > 1 \end{cases}$ (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°C and 100°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 $3/8^{\text{th}}$ 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)

