



B.Tech III Semester Supplementary Examinations, March/April 2023

NUMERICAL METHODS & TRANSFORMS
(Common to EEE & ECE)

Maximum Marks: 70

Date:27.03.2023 Duration: 3 hours

- Note:
- 1.This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define algebraic and transcendental equations with example.
- 2 Derive a formula to find the cube root of N using Newton Raphson Method.
- 3 State Newton's Forward difference Interpolation formula.
- 4 If $f(0)=1, f(1)=2.7, f(2)=74, f(3)=20.1, f(4)=54.6$ and $h=1$ then find $\int_0^4 f(x)dx$ by Simpson's $1/3^{rd}$ rule.
- 5 Using Taylor's Series Method find $y(0.1)$ for $\frac{dy}{dx} = 1 + y$ with $y(0) = 2$.
- 6 Using Euler's Method find $y(0.2)$ given that $\frac{dy}{dx} = y + e^x, y(0) = 0$.
- 7 Define Fourier series of a function $f(x)$.
- 8 Define Fourier cosine and Sine transforms.
- 9 Find Z transform of a^n
- 10 Find Z transform of the sequence is defined by $f_n = \begin{cases} 2^n, n \geq 0 \\ 0, n \leq 0 \end{cases}$

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 a) Find the Positive root of the equation $x \log_{10}(x) - 1.2 = 0$ using Bisection Method. (5M)
b) Find the root of the equation $e^x = 3x$ by the Method of False Position. (5M)
- OR
- 12 Derive a formula to find the cube root of N using Newton Raphson Method and hence find the cube root of "15". (10M)
- 13 a) Using Gauss Backward formula, find $y(8)$ from the following table: (5M)

x	0	5	10	15	20	25
y	7	11	14	18	24	32

- b) Evaluate $\int_0^1 \frac{1}{1+x} dx$ by Trapezoidal rule. (5M)

- 14 a) Using Lagrange's interpolation formula, find $y(10)$ from the following table: (5M)

x	5	6	9	11
y	12	13	14	16

- b) Evaluate $\int_0^1 e^x dx$ by Simpson's $\frac{3}{8}$ rule. (5M)
- 15 Obtain $y(0.1)$ and $y(0.2)$ using Runge-Kutta fourth order formula given that $\frac{dy}{dx} = x^2 - y$ and $y(0) = 1$. (10M)

- 16 Obtain the values of y at $x = 0.1, 0.2$ using Taylor's Series Method for $\frac{dy}{dx} = x - 2y, y(0) = 1$. (10M)

- 17 Find the Fourier series of the function defined as $f(x) = \begin{cases} -\pi, & \text{for } -\pi < x \leq 0 \\ x, & \text{for } 0 \leq x < \pi \end{cases}$. Hence evaluate that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$. (10M)

- 18 Using Fourier integral show that $e^{-ax} - e^{-bx} = \frac{2(b^2 - a^2)}{\pi} \int_0^\infty \frac{p \sin px dx}{(p^2 + a^2)(p^2 + b^2)}, a, b > 0$ (10M)

- 19 If $F(z) = \frac{5z^2 + 3z + 12}{(z-1)^4}$ find the values of $f(2)$ and $f(3)$ (10M)

- 20 Find the inverse Z transform of $\frac{z^2 + 2z}{(z-1)(z-2)(z-3)}$ (10M)