



B.Tech III Semester Supplementary Examinations, February 2024

Numerical Methods and Transforms
 (Common to EEE & ECE)

Maximum Marks: 70

Date: 16.02.2024 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)		CO	BTL
1	Construct the interval in which a root of $3x - e^x = \sin x = 0$ lies.	CO1	L3
2	Find positive square root of 12 up to 4 decimal places.	CO1	L1
3	Write Newton Gregory backward interpolation formula.	CO2	L1
4	Write Simpson's $\frac{3}{8}$ formula.	CO2	L1
5	If $y' = y - x$ and $y(0) = 1$ find $y(0.2)$ by Euler's method, taking $h = 0.2$.	CO3	L3
6	Write the limitation of Taylor's series method?	CO3	L1
7	Define finite Fourier sine and cosine transforms.	CO4	L1
8	Define Finite Fourier sine and cosine transforms and their inversion formula in $0 < x < L$.	CO4	L1
9	Explain Z- transform.	CO5	L2
10	State final value theorem for Z-transform.	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO	BTL
11	A. Find a root of the equation $x(1 - \log_e x) = 0.5$ correct to three decimal places using Newton Raphson method. B. Find an approximate value of the root of the equation $x^3 + x - 1 = 0$ near $x = 1$, correct to three decimal places using the method of false position.	5M 5M	CO1 L3
OR			
12	A. Find a root of the equation $x^3 - 4x - 9 = 0$ correct to three decimals by using bisection method. B. Find a positive real root of the equation $x \sin x + \cos x = 0$, correct to four decimal places using false position method.	5M 5M	CO1 L3

13	The following table gives the population of a town during the last censuses. Estimate, using Newton's interpolation formula, the increase in the population during the year 1948 <table><tr><td>Year</td><td>1911</td><td>1921</td><td>1931</td><td>1941</td><td>1951</td><td>1961</td></tr><tr><td>Population</td><td>12</td><td>15</td><td>20</td><td>27</td><td>39</td><td>52</td></tr></table> (in thousands)	Year	1911	1921	1931	1941	1951	1961	Population	12	15	20	27	39	52	10M	CO2	L5
Year	1911	1921	1931	1941	1951	1961												
Population	12	15	20	27	39	52												
	OR																	
14	A. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Simpson's $\frac{3}{8}$ rule B. Evaluate $\int_0^6 e^{-x^2} dx$ using Trapezoidal rule taking step size $h = 0.2$	5M 5M	CO2	L5														
15	Find $y(0.1)$ and $y(0.2)$ using Runge- Kutta fourth order formula give that $\frac{dy}{dx} = x + x^2 y$ and $y(0) = 1$	10M	CO3	L5														
	OR																	
16	Given $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ that Determine $y(0.1)$ by modified Euler's method	10M	CO3	L5														
17	Obtain Fourier series for $f(x) = x + x^2$ in $-\pi < x < \pi$ and deduce that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$	10M	CO4	L5														
	OR																	
18	A. Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{for } -1 < x < 1 \\ 0 & \text{for } x < -1, x > 1 \end{cases}$ and hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$ B. Find the Fourier sine transform of $x e^{-2x}, x > 0$	5M 5M	CO4	L5														
19	A. Show that $Z\left[\frac{1}{n}\right] = \log \frac{z}{z-1}$ B. Find $Z\left[\sin \frac{n\pi}{2}\right]$	5M 5M	CO5	L2														
	OR																	
20	A. Solve the difference equation $u_{n+2} - u_n = 2^n$ by using Z-transform given that $u_0 = 0$ and $u_1 = 1$ B. Solve the difference equation $y(n+2) + 3y(n+1) + 2y(n) = 0$ given $y(0) = 0$ and $y(1) = 1$	5M 5M	CO5	L3														