Code No : **20SH2T01** **R20**

I B. TECH II SEMESTER REGULAR EXAMINATIONS, SEPTEMBER - 2021
MATHEMATICS - II
(Common to All Branches)

Time : 3 Hours **Max. Marks : 70**

Note : Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

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UNIT-I

1. a) Find a root of the following equation using Bisection method, correct to two decimal places $x^3 - x - 1 = 0$. [7M]

   b) Find by Newton's method, the real root of the equation $3x = \cos x + 1$. [7M]

(OR)

2. a) Solve $20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$ by Gauss Jacobi method. [7M]

   b) Derive the iterative formula for finding $\frac{1}{N}$ using Newton-Raphson method and also find the value of $\frac{1}{32}$ correct to four decimal places. [7M]

UNIT-II

3. a) (i) Show that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$. [7M]

   (ii) Find the function $f(x)$, if its first order forward difference is $x^2 + 5x$ and $f(0) = 2$, interval of differencing being 1.

   b) Interpolate by means of Gauss's backward formula the population of a town for the year 1974 from [7M]

Year	1939	1949	1959	1969	1979	1989
Population (in thousands)	12	15	20	27	39	52

(OR)

4. a) A curve passes through the points (0, 18), (1, 10), (3, -18) and (6, 90). Find the slope of the curve at $x = 2$. [7M]

   b) Given $\sin 45^0 = 0.7071$, $\sin 50^0 = 0.7660$, $\sin 55^0 = 0.8192$, $\sin 60^0 = 0.8660$, find $\sin 52^0$ using Newton's forward formula. [7M]
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UNIT-III

5. a) Given that [6M]

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
log x	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate $\int_4^{5.2} \log x \, dx$ by

(i) Simpson's 1/3rd rule; (ii) Trapezoidal rule; (iii) Simpson's 3/8th rule.

b) Using Picard's process of successive approximation, obtain a solution upto the fifth approximation of the equation $\frac{dy}{dx} = y + x$ such that $y = 1$ when $x = 0$. [8M]

(OR)

6. a) Use Euler's modified method to compute y for 0.1 and 0.2, given that $\frac{dy}{dx} = x + y^2$, $y(0) = 1$. [7M]

b) Obtain the value of y at $x = 0.2$, if y satisfying $\frac{dy}{dx} = x^2 y + x$, $y(0) = 1$, taking $h = 0.1$, using R-K method of fourth order. [7M]

UNIT-IV

7. a) Find $L\left[2^t + \frac{\cos 2t - \cos 3t}{t} + t\sin t\right]$. [7M]

b) Find $L^{-1}\left[\log\left(\frac{s^2+1}{(s-1)^2}\right)\right]$. [7M]

(OR)

8. a) Find $L\left[\int_0^t \frac{1-e^{-u}}{u}\, du\right]$. [6M]

b) Use transform method to solve $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t$ with $x = 2$, $\frac{dx}{dt} = -1$ at $t = 0$. [8M]

UNIT-V

9. a) Obtain the Fourier series for $f(x) = \left(\frac{\pi - x}{2}\right)^2$, in $0 < x < 2\pi$ [8M]

b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$. [6M]

(OR)

10. a) Find the Fourier series for $f(t) = 1 - t^2$, when $-1 \le t \le 1$. [6M]

b) Given $F\left[e^{-x^2}\right] = \sqrt{\pi} e^{-s^2/4}$, find the Fourier transforms of [8M]

(i) $e^{-x^2/3}$; (ii) $e^{-4(x-3)^2}$.

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