MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER B.TECH GRADEIMPROVEMENT/MAKEUP EXAMINATION
AUGUST-SEPTEMEBR 2020-21
SUBJECT: ENGINEERING MATHEMATICS -1 [MAT-1151]

REVISED CREDIT SYSTEM
(06/09/2021)

Time: 2 hrs. Max. Marks: 40

Instructions to Candidates:

- Answer ANY FOUR FULL questions & missing data may be suitably assumed.

1A. Solve $10x_1 + 2x_2 + x_3 = 9, x_1 + 10x_2 - x_3 = -22, -2x_1 + 3x_2 + 10x_3 = 22$ By Gauss-Seidel method. Carry out 4 iterations up to 4 decimal places.

1B. Solve $(D^2 - 1)y = \frac{2}{1+e^x}$ by the method of variation of parameters. **(5+5)**

2A. Solve $y(2x - y + 1)dx + x(3x - 4y + 3)dy = 0$.

2B.Using modified Euler's method find y at $x = 0.2$ given $\frac{dy}{dx} = 3x + \frac{y}{2}$ with $y(0) = 1$

taking $h = 0.1$. Perform three iterations at each step. **(5+5)**

3A. Find the root of the equation $e^x = 2x + 1$, correct to 4 decimal places using Newton-Raphson method by taking initial value $x_0 = 1.75$. Carry out 4 iterations.

3B. Investigate the values of λ and μ such that the system of equations $x + y + z = 6$, $x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ may have
(a) Unique solution (b) Infinite solution (c) No solution. **(5+5)**

4A. Use Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to find $\int_0^{0.6} e^{-x^2}\, dx$ by taking 6 sub intervals.

4B. Solve $(D^2 - 4D + 4)y = x^2e^{3x} + \sin^2 x$. **(5+5)**

5A. Fit an interpolating polynomial for the data
$u_0 = -5, u_1 = -14, u_4 = -12.5, u_8 = -21, u_{10} = 355$ by using Newton's interpolation formula and find u_2.

5B. Show that the subset $B = \{v_1, \dots, v_n\}$ of a vector space V is a basis of V if and only if every vector of V can be written as a linear combination of vectors of B in a unique way. **(5+5)**

6A. Using Gram-Schmidt process find an orthogonal set of vectors from
$\{(1, 1, 0), (1, 0, -2), (1, 1, 1)\}$.

6B. Find all eigen values and eigen vectors of the matrix $\begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$. **(5+5)**

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