Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER B.TECH END SEMESTER EXAMINATIONS, November, 2018

SUBJECT: ENGINEERING MATHEMATICS I (MAT 1151)

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 19.11.2018 MAX. MARKS: 50

Instructions to Candidates

- Answer **ALL** the questions.

1A.	Reduce the matrix $A=\begin{bmatrix} 1 & 4 & 5 & -9 & -7 \\ -1 & -2 & -1 & 3 & 1 \\ -2 & -3 & 0 & 3 & -1 \\ 0 & -3 & -6 & 4 & 9 \end{bmatrix}$ to echelon form and hence find rank of A.	3
1B.	Solve $10x + 2y + z = 9, -2x + 3y + 10z = 22, x + 10y - z = -22$ by Gauss-Seidel method. Carry out four iterations upto four decimal places.	3
1C.	Solve $xy \ln\left(\frac{x}{y}\right) dx + \left(y^2 - x^2 \ln\left(\frac{x}{y}\right)\right) dy = 0.$	4
2A.	Find all the eigenvalues and eigenvector corresponding to least eigenvalue of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.	3
2B.	Solve $x^2y'' + 3xy' + y = \frac{1}{(1-x)^2}$.	3
2C.	Solve the simultaneous differential equations $\frac{dx}{dt} = 5x + y$, $\frac{dy}{dt} = y - 4x$.	4
3A.	Evaluate $\int_0^{\frac{\pi}{2}} \frac{cosx}{1+x} dx$ by Simpson's $\frac{1}{3}$ rule with $h = \frac{\pi}{12}$.	3
3B.	Using modified Euler's method, solve the initial value problem $\frac{dy}{dx} = log_{10}(x + y)$, $y(0) = 2$ at x = 0.2. Take $h = 0.2$.	3

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3C.	Given $y' = y^2 + x$, $y(0)=1$, find $y(0.1)$ and $y(0.2)$ using Taylor's series method, by considering terms up to x^4.	**4**
4A.	Obtain a real root of the equation $3x + \sin x - e^x = 0$ near $x_0 = 0$ by Newton Raphson method. Carry out four iterations correct to 4 decimal places.	**3**
4B.	Use Lagrange's interpolation formula to find the value of x when $y = 20$ using the following data: x: 1, 2, 3, 4 y: 1, 8, 27, 64	**3**
4C.	Test for consistency, if consistent solve by Gauss elimination method $2x_1 - 2x_2 + 4x_3 + 3x_4 = 9$ $x_1 - x_2 + 2x_3 + 2x_4 = 6$ $2x_1 - 2x_2 + x_3 + 2x_4 = 3$ $x_1 - x_2 + x_4 = 2.$	**4**
5A.	Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2e^{3x} + Sin^2x.$	**3**
5B.	Using Gram-Schmidt process find an orthogonal set of vectors from $\{(1,1,0), (1,0,-2), (1,1,1)\}$.	**3**
5C.	Define minimal spanning set of vectors. Prove that a minimal spanning set of vectors forms a basis.	**4**