Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, December, 2018
SUBJECT: ENGINEERING MATHEMATICS I (MAT 1151)
REVISED CREDIT SYSTEM

Time: 3 Hours Date: 21.12. 2018 MAX. MARKS: 50

Instructions to Candidates

- Answer **ALL** the questions.

1A. Find all the eigenvalues and eigenvector corresponding to largest eigenvalue of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **3**

1B. Use fourth order R-K method find $y(0.5)$ for the equation : $(x+y)\frac{dy}{dx} = 1$, $y(0.4) = 1$ correct to four decimal places. Take $h = 0.1$ **3**

1C. Solve by the method of variation of parameters , $\frac{d^2y}{dx^2} - y = \frac{2}{(1+e^x)}$ **4**

2A. Reduce the matrix $A = \begin{bmatrix} 2 & 1 & 3 & 4 \\ 4 & 0 & 2 & 1 \\ 2 & 3 & 4 & 7 \\ 2 & 3 & 1 & 4 \end{bmatrix}$ to echelon form & hence find rank of A. **3**

2B. Solve the system of equations

$$10x + y + z = 12$$
$$x + 10y + z = 12$$
$$x + y + 10z = 12$$

by Jacobi's iterative method. Carry out four iterations up to four decimal places. Take initial approximations $x_0 = 0$, $y_0 = 0$, $z_0 = 0$ **3**

2C. Solve $xy(1+xy^2)\frac{dy}{dx} = 1$ **4**

06/12/18

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3A. Using Simpson's 1/3 rule, evaluate the integral $\int_0^1 \frac{dx}{1+x^2}$ with 6 sub intervals. and hence find the value of π. 3

3B. Solve $(2x-1)^2 \frac{d^2y}{dx^2} + (2x-1)\frac{dy}{dx} - 2y = 8x^2 - 2x + 3$ 3

3C. Test for consistency and solve

$x + y + z = 6$

$x - y + 2z = 5$

$3x + y + z = 8$ 4

4A. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 8e^{2x} x^2 \sin 2x$ 3

4B. Define maximal linearly independent set of vectors. Prove that a set of non-zero orthogonal vectors are linearly independent. 3

4C. Using Lagrange's formula find the value of f(3), given

x	0	1	2	5
f(x)	2	3	12	147

4

5A. Find the root of the equation $x e^x = \cos x$ in the interval (0,1) using the method of false position. Carry out four iterations correct to four decimal places 3

5B. Using Gram-Schmidt process, construct an orthonormal basis vectors from : (2, 3, 0), (6, 1, 0) and (0, 2, 4) 3

5C. Solve by third order Taylor series method of the equation $\frac{dy}{dx} = \frac{x^3 + xy^2}{e^x}$, $y(0) = 1$ for y at $x = 0.1$ and $x = 0.2$ 4