Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

I SEMESTER B.TECH.

END SEMESTER EXAMINATIONS, NOVEMBER 2019

SUBJECT: ENGINEERING MATHEMATICS I [MAT 1151]

REVISED CREDIT SYSTEM

(14/11/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions. Missing data may be suitably assumed.

Q1. Solve $6y^2dx - x(x^3 + 2y)dy = 0.$ (3)

Q2. The velocity (v) of a car which starts from rest, is given at fixed intervals of time (t) as follows.

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered by car in 20 units of time using Simpson's $^1/_3\,rd$ rule. (3)

Q3. Solve $(D-2)^2y = 8(e^{2x} + sin2x + x^2).$ (4)

Q4. Solve by the method of variation of parameters $y'' + y = \sec^2 x.$ (3)

Q5. Solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2\sin(\ln x)$ (3)

Q6. Using 4th order Runge Kutta method , solve $y' = x + y^2$ with $y(0) = 1$ at $x = 0.2$ in steps of length $h = 0.1.$ (4)

(PTO)

Q7. The distance covered by an athlete for 50 m is given in the following table.

Time 't' (sec)	0	1	2	3	4	5	6
Distance's' (m)	0	2.5	8.5	15.5	24.5	36.5	50

Determine the velocity and acceleration of an athlete at t = 6 seconds. (3)

Q8. Fit a polynomial for the following data points

x	0	1	2	5
y	2	3	12	147

(3)

Q9. Solve $2x+y+6z=9,\quad 8x+3y+2z=13,\quad x+5y+z=7$ by Gauss-Seidel iteration method. Carry out four iterations. (4)

Q10. Given $\frac{dy}{dx} = 1 + xy, y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ by modified Euler's method with $h = 0.1$. Carryout 2 iterations at each stage. (3)

Q11. Find a real root of the equation $x \log_{10} x = 1.2$, using the Newton-Raphson method by taking the initial approximation $x_0 = 2$. Carryout 4 iterations. (3)

Q12. Construct orthonormal Basis using Gram-Schmidt orthogonalization process from the set of vectors $\{(2,2,1), (-2,1,2), (18,0,0)\}$ (4)

Q13. Find all the Eigen values and any one of the Eigen vector of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. (3)

Q14. FindA^{-1}, if $A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & -1 \\ 1 & 1 & -1 & 1 \\ 1 & -1 & 1 & 1 \end{bmatrix}$ by Gauss Jordan elimination method. (3)

Q15. Show that the subset $B = \{v_1, \ldots, v_n\}$ 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. (4)

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