Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

I SEMESTER M.TECH. (MECHANICAL ENGINEERING)

END SEMESTER MAKEUP EXAMINATIONS, NOV/DEC 2017

SUBJECT: APPLIED NUMERICAL METHODS [MAT 5101]

REVISED CREDIT SYSTEM
(02/01/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Perform one iteration of Bairstow method to extract the quadratic factor of the polynomial $x^4 + x^3 + 2x^2 + x + 1 = 0$ .Take the initial approximation as (0.5, 0.5).	**4**
1B.	Prove that nth difference of an nth degree polynomial is a constant	**3**
1C.	Solve the equations by relaxation method $-2x + 2y + 7z = 19, 9x - 2y + z = 50, x + 5y - 3z = 18$.	**3**
2A.	Obtain the error in Simpson's 1/3rd rule.	**4**
2B.	Apply Milne's method to find $y(0.8)$ of the differential equation $y' = x - y^2, 0 \le x \le 1, y(0) = 0$ Given y(0.2)=0.02, y(0.4)= 0.0795, y(0.6)= 0.1762	**3**
2C.	Define functionals and base function in finite element method. Give one example for each.	**3**
3A.	Determine the largest eigen value and the eigen vector of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$. Carry out 5 iterations with initial vector as $[1, 0, 0]^T$	**4**
3B.	Solve $y'' - 2x^2 y' + 2y = 0, y(0) + y'(0) = 5, y(1) = 0$ .Take h = 0.5	**3**
3C.	Derive Newtons forward interpolation formula	**3**
4A.	Solve $u_{tt} = u_{xx}, 0 < x < 1, t > 0$, $u(x,0) = 100 \sin \pi x$, $u(0,t) = 0$, $u(1,t) = 0$. $u_t(x,0) = 0$ compute "u" for 4 time steps with $h = 0.25$.	**4**
4B.	Calculate $\sqrt[3]{41}$ correct to four decimal place	**3**

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4C. Evaluate f(9) using Newton's divided difference formula, given: **3**

x:	5	7	11	13	17
f(x)	150	392	1452	2366	5202

5A. A slider in a machine moves along a fixed straight rod. Its distance x cm along the rod is given below for various time t seconds. Find the velocity and acceleration of the slider when $t = 0.3$ seconds. **4**

t	0	0.1	0.2	0.3	0.4	0.5	0.6
x	30.13	31.62	32.87	33.64	33.95	33.81	33.24

5B. Solve the equations by Gauss-Seidel method **3**

$2x + y + 6z = 9$; 8x+3y+2z=13 ; x+5y+z=7 , carryout three iterations.

5C. Solve the equation $\frac{d^4y}{dx^4} + 81y = \phi(x)$, $y(0) = y'(0) = y''(1) = y'''(1) = 0$ where $\phi(x)$ is given by the table: **3**

x	1/3	2/3	1
$\phi(x)$	81	162	243