Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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I SEMESTER M. TECH END SEMESTER EXAMINATIONS, MARCH - 2021

SUBJECT: APPLIED NUMERICAL METHODS-II [MAT-5155]

REVISED CREDIT SYSTEM
(05/03/2021)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

1. Answer **ALL** the questions. 2. All questions carries equal marks.

1A.	Using forward difference formula. Find the sum of $S_n = 1^3 + 2^3 + 3^3 + \cdots + n^3$	**3**
1B.	Solve the following equations by Cholesky method: $x + 2y + 3z = 5; 2x + 8y + 22z = 6; 3x + 22y + 82z = -10$	**3**
1C.	Using Adam's- Bashforth method, obtain the solution of $\frac{dy}{dx} = \frac{1}{2}xy$ at $x = 0.4$ for the data given below x: 0, 0.1, 0.2, 0.3 y: 1, 1.0025, 1.0101, 1.0228	**4**
2A.	Solve for a positive root of $3x = \cos x + 1$ by Newton-Raphson method.	**3**
2B.	Using Newton's divided difference formula, evaluate f(8) and f(15) for the data given below x: 4, 5, 7, 10, 11, 13 y: 48, 100, 294, 900, 1210, 2028	**3**
2C.	Perform two iterations of Birge-Vieta method to find the smallest positive root of the polynomial $2x^3 - 5x + 1 = 0$. Take the initial approximation as 0.5. Also obtain the deflated polynomial.	**4**
3A.	Using Crank-Nickolson's Scheme, solve $u_t = \frac{1}{16}u_{xx}$; $0 < x < 1$, $t > 0$, $u(x,0) = 100\sin \pi x$, $u(0,t) = 0$, $u(1,t) = 0$. Take k=1 and compute "u" for 2 time step with $h = 0.25$.	**5**

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3B	The angular displacement θ of a simple pendulum is given by $\frac{d^2\theta}{dt^2} + \frac{g}{l} sin\theta = 0$ where $l = 98cm \; and \; g = 980cm/sec^2$. If $\theta = 0 \; and \; \frac{d\theta}{dt} = 4.427$ at $t = 0$, use Runge -Kutta method order 4. Find $\theta \; and \; \frac{d\theta}{dt}, when \; t = 0.2 \; sec.$	**5**
4A.	Solve the boundary value problem $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ with the conditions $u(0,\ t) = u(4,\ t) = 0,\ u(x,0) = \ x(4-x) \ and \frac{\partial u}{\partial t}(x,0) = 0, 0 \le x \le 4$, taking $h = 1 \; and \; k = 0.5$, for third level solution in time t.	**5**
4B.	Explain Thomas algorithm to solve the tri-diagonal system of equations and hence solve $2x + y = 0$; $3x + y + z = 1$; $2y + z + u = 0$; $3z - u = 2$.	**5**
5A.	Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, 0 < x < 1, 0 < y < 1, u(x,1) = u(0,y) = 0$ $u(1,y) = 9(y - y^2), u(x,0) = 9(x - x^2)$ at the pivotal points. Perform two iteration by Gauss-Seidel method. Take h=1/3.	**5**
5B	From the following table, find the velocity and acceleration at $x = 2.03$	**5**

x	1.96	1.98	2.00	2.02	2.04
y	0.7825	0.7739	0.7651	0.7563	0.7473

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