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, AUGUST 2021

SUBJECT: APPLIED NUMERICAL METHODS [MAT 5155]

REVISED CREDIT SYSTEM
(16/08/2021)

Time: 3 Hours MAX. MARKS: 40

Instructions to Candidates:

1. Answer **ANY FOUR** questions. 2. Missing data may be suitable assumed.

1A.	Perform two 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).	**6**
1B.	Solve the equations by Cholesky method: $x+2y+3z=5; 2x+8y+22z=6; 3x+22y+82z=-10$	**4**
2A.	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**
2B.	Evaluate the pivotal values of the boundary value problem $\frac{\partial^2 u}{\partial t^2}=16\frac{\partial^2 u}{\partial x^2}=0$ by taking $h=1$ up to $t=0.75$ with the boundary conditions $u(0,t)=u(5,t)=0$ and the initial conditions $u(x,0)=x^2(5-x)$ and $u_t(x,0)=0$	**6**
3A.	Fit an interpolating polynomial by using Lagrange's interpolation formula, for the data given below x: 1, 2, 4, 5 y: 14, 41, 197, 350	**4**
3B.	The deflection of a beam is governed by the equation $\frac{d^4y}{dx^4}+81y=\phi(x)$, where $\phi(x)$ is given by the table x: 1/3, 2/3, 1 $\phi(x)$: 81, 162, 243 and the boundary conditions $y(0)=y^{1}(0)=y^{11}(1)=y^{111}(1)=0$. Evaluate the deflection at the pivotal points of the beam using 3 sub intervals.	**6**

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4A.	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 $[1, 0, 0]^T$	**5**
4B.	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 1.25 time step with $h = 0.25$.	**5**
5A.	Solve the equations by Triangularization method $x + 5y + z = 14; 2x + y + 3z = 13; 3x + y + 4z = 17$, Take l_{ii}=1.	**5**
5B.	Solve the equations by Gauss-Seidel method $2x + y + 6z = 9$; 8x+3y+2z=13 ; x+5y+z=7 , carryout three iterations.	**5**
6A.	From the following table, find $y^1(2)$ and $y^{11}(4.5)$	**5**
6B.	Evaluate $\int_0^{\pi/2} \sqrt{1-(0.162)\sin^2\theta}$ by using Simpson's 3/8 th rule with seven ordinates	**5**

x	-2	-1	0	1	2	3
y	0	0	6	24	60	120