Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

I SEMESTER M.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKEUP EXAMINATIONS, JANUARY 2018

SUBJECT: Computational methods & Applied Linear Algebra [MAT 5109]

REVISED CREDIT SYSTEM
(02/01/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Solve the differential equations $\frac{dy}{dx}=1+xz;\quad \frac{dz}{dx}=-xy$ for x=0.1 using fourth order Runge Kutta method. Initial values are x=0, y=0 and z=1.	**4**
1B.	Solve the boundary value problem using finite difference method $y''+xy=1,\quad y(0)=0,\quad y'(1)=1\ ,\ h=0.5.$	**3**
1C.	The following data gives the velocity of a particle for 8 seconds at an interval of 2 seconds. Find the initial acceleration using the entire data. Time: 0, 2, 4, 6, 8 Velocity: 0, 172, 1304, 4356, 10288	**3**
2A.	Solve the LPP by simplex method. Maximize $Z=10x_1+x_2+2x_3$ subject to the constraints $x_1+x_2-2x_3\le 10\ ,\quad 4x_1+x_2+x_3\le 20,\quad x_1\ge 0,\ x_2\ge 0,\quad x_3\ge 0.$	**4**
2B.	Show that any set of n linearly independent vectors forms a basis for a vector space V over a field F.	**3**
2C.	Solve the system of equations by Gauss elimination method 2x+y+z-2w= -10, 4x+2z+w = 8, 3x+2y+2z = 7, x+3y +2z –w = -5	**3**
3A.	Compute the value of $\int_{0.2}^{1.4}(\sin x-\log x+e^{x})dx$ using Simpson's 3/8 th rule by taking n=6.	**4**
3B.	Verify Cayley Hamilton theorem for the matrix A= $\begin{bmatrix}1 & 4\\ 2 & 3\end{bmatrix}$ and hence find its inverse	**3**
3C.	Find the largest eigenvalue and its corresponding eigenvector of a matrix A = $\begin{bmatrix}1 & 3 & -1\\ 3 & 2 & 4\\ -1 & 4 & 10\end{bmatrix}$ using Power method. Take $X_0=[1\quad 0\quad 0]^T$ as the initial eigen vector. Carry out 3 iterations.	**3**

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4A.	Find the optimal solution of the transportation problem using MODI method. $$\begin{array}{llccccl} & & A & B & C & D & \\ & I & 21 & 16 & 25 & 13 & 11 \\ Source & II & 17 & 18 & 14 & 23 & 13\ Availability \\ & III & 32 & 27 & 18 & 41 & 19 \\ Requirement & & 6 & 10 & 12 & 41 & \end{array}$$	**5**
4B.	Given $\frac{dy}{dx} = xy + y^2, \quad y(0) = 1, \quad y(0.1) = 1.1169, \quad y(0.2) = 1.2773, \quad y(0.3) = 1.504.$ Evaluate y(0.4) by Milne's Predictor corrector method.	**5**
5A.	Use Gram- Schmidth orthogonalization process to compute the orthonormal basis from the basis $S = \{(1, 1, 1), (-1, 0, -1), (-1, 2, 3)\}$ of R^3	**4**
5B.	Solve $U_{xx} + U_{yy} = -81xy, \quad 0 < x < 1, \quad 0 < y < 1,$ taking h=1/3. The boundary conditions are $u(0, y) = u(x,0) = 0, \quad u(1, y) = u(x, 1) = 100.$	**3**
5C.	Use Taylor's series method to solve $\frac{dy}{dx} = x^2 y - 1$ at x=0.1. The initial condition at x=0 is y=1.	**3**