Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIRST SEMESTER M.TECH (MECHTRONICS) SEMESTER EXAMINATIONS

August 2021

SUBJECT: MATHEMATICS FOR SIMULATION AND MODELLING

[MAT -5162]

REVISED CREDIT SYSTEM

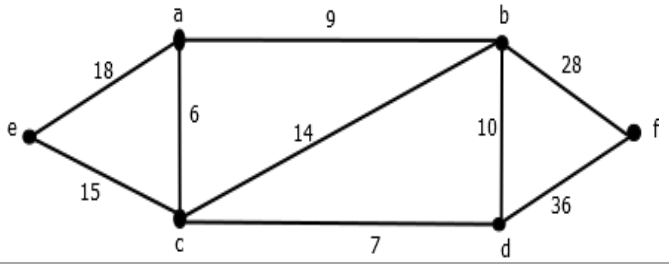
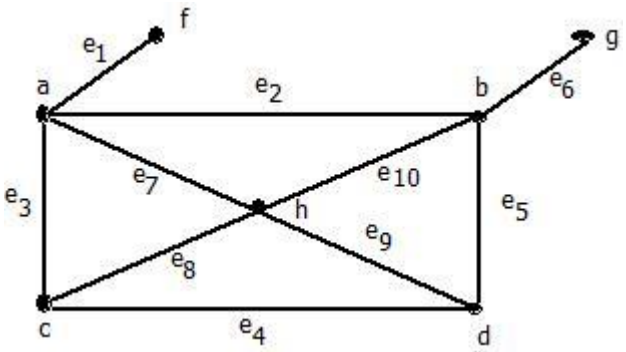
(20/08/2021)

Time: 2-5 PM Hours MAX. MARKS: 40

Instructions to Candidates:

- Answer **FOUR FULL** questions.
- Missing data's can be assumed suitably

1A.	Write the twelve point procedure for solving problems through Mathematical modelling.	**5**
1B.	Solve the system of equations by LU decomposition method $x + 2y + z = 0,\ 2x + 2y + 3z = 3, -x - 3y = 2$	**5**
2A.	solve the following system of equations using SOR method $3x - y + z = -1, -x + 3y - z = 7, x - y + 3z = -7.$ Carryout three iterations.(where over relaxation factor (w =1.25)	**5**
2B.	Using Runge – kutta method solve $y'' = x\left(y'\right)^2 - y^2$, $x = 0.2$, $y(0) = 1$, $y'(0) = 0$ to find y(0.2) and $y'(0.2)$.	**5**
3A.	Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$, $0 < x < 1$, $t > 0$. $u(x,0) = 0$, $\frac{\partial u(x,0)}{\partial t} = 0$, $u(0, t) = 0$, $u(1,t) = 100\sin\pi t$. choosing h = 0.25, compute u for three time steps.	**5**

3B.	Perform one iteration to extract a quadratic factor using Lin – Bairstow's method from the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 9 = 0$. $P_0 = 3$, $Q_0 = -5$.	**5**
4A.	Solve the boundary value problem $y'' + x^2 y = 0 , y(0) = 0 = y(1)$, using Galerkine method and hence find the value of y(0.5)	**5**
4B.	The profit per acre of a form is $f(x_1, x_2) = 20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$ Where x_1 is labor cost and x_2 is the fertilizer cost. Find the value of x_1 and x_2 to maximize the profit using Hessian matrix.	**5**
5A.	Minimize $f(x, y) = x^2 + y^2 + 60x$ subject to $x \geq 80$, $x + y \geq 120$ using Kuhn –Tucker conditions.	**5**
5B.	Find the maximum value of the function $f(x_1, x_2) = 2x_1 + x_2 + 10$ subject to $g(x_1, x_2) = x_1 + 2x_2^2 - 3 = 0$ using Lagrange's multiplier method.	**5**
6A.	Use Dijkstra's algorithm on the connected weighted graph to find the shortest path from 'e' to 'f' 	**5**
6B.	Write adjacency, incidence matrix for the graph shown in figure below 	**5**