

(Subject Code and Roll No. to be filled in your Answer Book)

Roll No XXXXXXXXXX

M.Tech.

(SEM. I) THEORY EXAMINATION 2012–13

**NUMERICAL METHODS AND
OPERATION RESEARCH**

Time : 3 Hours

Total Marks : 100

- Note :-** (i) Attempt all questions.
(ii) All questions carry equal marks.
(iii) Assume the missing data if any.

1. Attempt any **four** of the following :

- (a) Find the real root correct to 3 decimal places of the following equation by Regula Falsi Method : $x^3 - 2x - 5 = 0$.
- (b) Given $u_1 = 40$, $u_3 = 45$, $u_5 = 54$, find u_2 and u_4 using Lagrange's Interpolation method.
- (c) Use Runge Kutta method of fourth order to find the numerical solution at $x = 0.8$ for $\frac{dy}{dx} = \sqrt{x + y}$, $y(0.4) = .41$
Assume step length $h = 0.2$.

(d) Find the missing terms in the given table :

x	1	2	3	4	5	6	7	8
F(x)	1	8	?	64	?	216	343	512

- (e) Using Picard's method of successive approximations, obtain the solution second approximation of the equation :

$$\frac{dy}{dx} = \frac{x^2}{y^2 + 1}, \quad y(0) = 0.$$

- (f) Find the equation of the cubic curve which passes through the points (4, -43), (7, 83), (9, 327) and (12, 1053).

2. Attempt any **two** of the following :

- (a) State Simpson's three-eight rules and hence evaluate

$$\int_0^6 \frac{1}{1+x} dx.$$

- (b) Solve the given LPP by using Graphical Method :

$$\text{Max } Z = 6x + y \text{ s.t.c. } 2x + y \geq 3, \quad y - x \geq 0 \text{ and } x, y \geq 0.$$

- (c) Determine the optimum basic feasible solution to the following transportation problem :

	A	B	C	Avail.
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requi.	4	2	2	

3. Attempt any **two** of the following :

- (a) Solve the given LPP by using Two Phase Method :

$$\text{Max } Z = 5x_1 + 8x_2 \text{ s.t.c. } 3x_1 + 2x_2 \geq 3, \quad x_1 + 4x_2 \geq 4, \\ x_1 + x_2 \leq 5, \quad x_1, x_2 \geq 0.$$

- (b) Solve the given LPP by using Dynamic Programming Problem :

$$\text{Max } Z = 2x_1 + 4x_2 \text{ s.t.c. } 2x_1 + 3x_2 \leq 48, \quad x_1 + 3x_2 \leq 42, \\ x_1 + x_2 \leq 21, \quad x_1, x_2 \geq 0.$$

- (c) Define Degeneracy in the Transportation Problems and solve the T.P. by VAM method :

	X	Y	Z	Avail.
A	8	7	3	60
B	3	8	9	70
C	11	3	5	80
Requirement	50	80	80	

4. Attempt **all** of the following :

- (a) Explain the following terms :

- (i) Artificial variables and Basic feasible solution
 (ii) Re order level and Cost associated with inventories.

- (b) Solve the following by using simplex method :

$$\text{Max } Z = 2x_1 + x_2 \text{ s.t.c. } 4x_1 + 3x_2 \leq 12, 4x_1 + x_2 \leq 8, \\ 4x_1 - x_2 \leq 8 \text{ and } x_1, x_2 \geq 0.$$

5. Attempt any **four** of the following :

- (a) Explain the following terms :

- (i) Hungarian Method
 (ii) Unbalanced transportation problem.

- (b) Find the maximize total expected profit of given assignment problem :

	A	B	C	D	E
P	5	11	10	12	4
Q	2	4	6	3	5
R	3	12	5	14	6
S	6	14	4	11	7
T	7	9	8	12	5

(c) Solve the following equation by Gauss Seidal Method :

$$2x + 10y + z = 51, x + 2y + 10z = 61, 10x + y + 2z = 44.$$

(d) From the following table, find the number of students who obtained less than 45 marks.

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

(e) Using Dynamic Programming find the value of :

$$\text{Min } Z = x_1 \log x_1 + x_2 \log x_2 + \dots + x_n \log x_n \text{ s.t.c.}$$

$$x_1 + x_2 + \dots + x_n = 1 \text{ and } x_1, x_2, \dots, x_n \geq 0.$$

(f) Solve the following Assignment problem :

	a	b	c	d.
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5