Exam Date & Time: 18-Jul-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

VI Semester End Semester Make Up Examination(Open Elective)
Optimization Techniques (MAT 5305)

OPTIMIZATION TECHNIQUES [MAT 5305]

Marks: 50 **Duration: 180 mins.**

Descriptive Questions

Answer all the questions. Section Duration: 180 mins

1) Define solution, basic feasible solution and optimal solution of an LPP (3)

A)

B) Express the following LPP in standard form:

$$\text{Maximize } Z = 3x_1 + 5x_2 - 2x_3$$

$$\text{Subject to } x_1 + 2x_2 - x_3 \geq -4, \; -5x_1 + 6x$$

$$2x_1 + x_2 + 3x_3 = 10, \; x_1, x_2 \geq 0$$

C) A home resourceful decorator manufactures two types of lamps say A and B. Both lamps go through two technicians, first a cutter and second a finisher. Lamp A requires 2 hours of the cutter's time and 1 hour of the finisher's time; lamp B requires 1 hour of cutter's and 2 hours of finisher's time. The cutter has 104 hours and finisher has 76 hours of available time each month. Profit on the Lamp A is Rs. 6 and on one B lamp is Rs. 11. Formulate a mathematical model to maximize the profit. (4)

2) Solve by Simplex method: $Minimize\ Z = x_1 - 3x_2 + 2x_3$

A) $subject\ to\ 3x_1 - x_2 + 3x_3 \leq 7;$

$-2x_1 + 4x_2 \leq 12; \quad -4x_1 + 3x_2 + 8x_3 \leq 10, \quad x_1, x_2, x_3 \geq 0$ (5)

B) What do you mean by duality in LPP? Write the dual of the L.P.P.

$$\text{Max } Z = 2x_1 + x_2$$

$$\text{subject to } -x_1 + 2x_2 \leq 2, \quad x_1 + x_2 \leq 4, \; x_1 \leq$$

3) Define looping and dangling in Network analysis (2)

A)

B) Explain the different type of activities in Network analysis. Give one example for each (3)

C) A steel company has three open hearth furnaces and five rolling mills. Transportation cost (Rupees per quintal) for shipping steel from furnaces to rolling mills are given in the following table: (5)

FurnaceMill	M1	M2	M3	M4	Capacity
P1	6	1	9	3	70
P2	11	5	2	8	55
P3	10	12	4	7	70
Requirement	85	35	50	45	

How should the steel be transported in order that the transportation cost is minimum? What is the minimum cost?

4) Solve the following assignment problem for minimizing the cost: (5)

A)

	I	**II**	**III**	**IV**
A	32	26	35	38
B	27	24	26	32
C	28	22	25	34

D	10	10	16	16

B) A project has the following time schedule:

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-6	5-8	6-9	7-8	8-9
Duration	2	2	1	4	8	5	3	1	5	4	3

(5)

Construct the network and compute (i)EST, LST, EFT, LFT of the activities (ii) Critical path and its duration

5) Find all the basic feasible solutions of the equations $2x+6y+2z+w = 3$, $6x+4y+4z+6w = 2$ and classify them as degenerate or not? (5)

A)

B) Solve the following game:

	B1	B2	B3	B4	B5	B6
A1	4	2	0	2	1	1
A2	4	3	1	3	2	2
A3	4	3	7	-5	1	2
A4	4	3	4	-1	2	2
A5	4	3	3	-2	2	2

(5)

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