BACHELOR OF SCIENCE (COMPUTER SCIENCE) (CBCS - 2018 COURSE)
S.Y.B.Sc.(Computer Science) Sem-IV : WINTER- 2022
SUBJECT : OPTIMIZATION TECHNIQUES

Day : Tuesday | Time : 02:00 PM-05:00 PM

Date : 13-12-2022 | **W-20106-2022** | Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable calculator is allowed.

Q.1 Attempt any **TWO** of the following: **(12)**

a) Use the graphical method to solve the following LP problem:

Maximize $Z = 2x_1 + x_2$

Subject to

$$x_1 + 2x_2 \leq 10$$
$$x_1 + x_2 \leq 6$$
$$x_1 - x_2 \leq 2$$
$$x_1 - 2x_2 \leq 1$$
$$\text{and } x_1, x_2 \geq 0$$

b) Using Big-M method solve the following LP problem

Maximize $Z = 5x_1 + 3x_2$

Subject to constraints

$$2x_1 + 4x_2 \leq 12$$
$$2x_1 + 2x_2 = 10$$
$$5x_1 + 2x_2 \geq 10$$
$$\text{and } x_1, x_2 \geq 0$$

c) A firm uses lathes, milling and grinding machines to produce two machine parts. The following table represents machining times required for each part, the machining time available on different machines and profit on each machine part.

Type of Machine	Time required (In minutes)		Time available (In Minutes)
	Part I	Part II	
Lathes	12	6	3000
Milling Machines	4	10	2000
Grinding	2	3	900
Profit Per Units	₹40	₹100	

Formulate this problem as LP model to maximize profit.

P.T.O.

b) Solve the following assignment problem:

		Men			
		A	B	C	D
Jobs	1	10	25	15	20
	2	15	30	5	15
	3	35	20	12	24
	4	17	25	24	20

c) Explain North-West Corner Method (NWCM) to obtain an initial basic feasible solution of T.P.

d) Solve the following LPP by simplex method.

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to

$$x_1 + 2x_2 + x_3 \leq 430$$
$$3x_1 + 2x_3 \leq 460$$
$$x_1 + 4x_2 \leq 120$$
$$x_1, x_2, x_3 \geq 0$$

Q.5 Attempt any **FOUR** of the following: **(12)**

a) Define:

i) Basic solution

ii) Optimal solution

b) Define unbalance transportation problem. Explain how unbalanced T.P. Convert into balanced T.P.

c) Define saddle point and find saddle point of game whose pay of matrix is given by

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \end{array} \begin{array}{c} \begin{array}{cc} B_1 & B \end{array} \\ \begin{bmatrix} 3 & 2 \\ -2 & -3 \\ -4 & -5 \end{bmatrix} \end{array}$$

d) How to convert maximization assignment problem into minimization assignment problem.

e) What is disadvantages of the graphical method in LPP?

f) Convert the following LPP into standard form

Maximize $Z = 3x_1 + 5x_2 + 4x_3$

Subject to

$$2x_1 + 3x_2 \leq 8$$
$$2x_1 + 5x_3 \leq 10$$
$$3x_1 + 2x_2 + 4x_3 \leq 15$$
and $x_1, x_2, x_3 \geq 0$

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Q.2 Attempt any **TWO** of the following: **(12)**

a) Explain steps involved in obtaining the optimal solution from initial basic feasible solution of transportation problem by MODI method.

b) Find the initial basic feasible solution of the following transportation problem by VAM. Also find total transportation cost.

	D_1	D_2	D_3	D_4	Capacity
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	

c) A department of company has five employees with five jobs to perform. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix.

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated one per employee, so as to minimize the total man-hour?

Q.3 Attempt any **TWO** of the following: **(12)**

a) Explain Hungerian method to solve assignment problem for minimization.

b) Solve the following game graphically:

Player B

Player A $\begin{bmatrix} 3 & -3 & 4 \\ -1 & 1 & -3 \end{bmatrix}$

c) Solve the following two persons 2×2 mixed strategy game.

Player B

Player A $\begin{bmatrix} 5 & 10 \\ 12 & 2 \end{bmatrix}$

Q.4 Attempt any **THREE** of the following: **(12)**

a) Find the dual of the following LPP

Maximize

$$Z = x_1 + 2x_2 + 3x_3 - x_4$$

$$x_1 + 2x_2 + x_3 = 15$$

$$2x_1 + x_2 + 5x_3 \leq 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

with $x_1, x_2, x_3, x_4 \geq 0$

..2