Examination: I Sem. M.Tech, Ph.D (Mining Engineering)   Session: 2024-25

Semester: Monsoon Semester   Max. Marks: 28

Subject: Mang. Decision Making NMND 501   Time: 2 Hrs.

Q1. Find a minimum-cost shipping schedule for the transportation problem using VAM for basic feasible solution and MODI for the final optimal solution.

(8 marks)

11. Coal is mined and processed at the following four mines in Kentucky, West Virginia, and Virginia.

Location	Capacity (tons)
A. Cabin Creek	90
B. Surry	50
C. Old Fort	80
D. McCoy	60
	280

These mines supply the following amount of coal to utility power plants in three cities.

Plant	Demand (tons)
1. Richmond	120
2. Winston-Salem	100
3. Durham	110
	330

The railroad shipping costs ($1,000s) per ton of coal are shown in the following table. Because of railroad construction, shipments are now prohibited from <u>Cabin Creek to Richmond.</u>

From	To		
	1	2	3
A	$ 7	$10	$ 5
B	12	9	4
C	7	3	11
D	9	5	7

a. Set up the transportation tableau for this problem, determine the initial solution using VAM, and compute total cost.

b. Solve using MODI.

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Q2.

Clearly show all steps and equations in solving the problem   (3 marks)

$$\text{maximize } 8x_1 - 9x_2 + 12x_3 + 4x_4 + 11x_5$$
$$\text{subject to } 2x_1 - 3x_2 + 4x_3 + x_4 + 3x_5 \leq 1$$
$$\text{(P)} \qquad x_1 + 7x_2 + 3x_3 - 2x_4 + x_5 \leq 1$$
$$5x_1 + 4x_2 - 6x_3 + 2x_4 + 3x_5 \leq 22$$
$$x_1, x_2, x_3, x_4, x_5 \geq 0$$

1. Write down the dual (D) of the problem (P).

Q3.

(8 marks)

A mine turns out two minerals A and B, each of which is processed to two machines X and Y. A requires two hours of X and 4 hours of Y; B requires 4 hours of X and 2 hours of Y. If x is the number of A and y is the number of B produced daily, write down two inequalities in x and y, noting that neither X nor Y can work more than 24 hours a day. Assuming that all minerals produced are sold, and A yields a profit of Rs. 60/unit and B yields a profit of Rs. 100/unit, find how much of each mineral should be produced daily for maximum profit.

a. Write the equations for linear programing
b. SOLVE Graphically by plotting the inequalities
c. Show the feasible region in the graph and the vertices
d. Find the optimal point that maximizes the objective function

Q5. Answer the following: each subsection carries 2 marks   (4 marks)

i.   List any 4 benefits of the First Mile connectivity project of CIL to mining logistics

ii.   List any 4 measures taken by the Indian railways to increase coal transportation

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Q6.   Use Hungarian Method to Solve

(5 marks)

(6) A company is faced with the problem of assigning six different machines M1, M2, M3, M4, M5, and M6 to six different jobs J1, J2, J3, J4, J5, and J6 respectively. The costs estimated (in hundreds of rupees) are given in the table below:

	J1	J2	J3	J4	J5	J6
M1	44	67	41	53	48	64
M2	46	69	40	45	45	68
M3	43	73	37	51	44	62
M4	50	65	35	50	46	63
M5	50	65	35	50	46	63
M6	50	65	35	50	46	63

(i) Formulate the problem as an assignment model for the assignment of machines to jobs so that the total cost of assignment is minimum.

(ii) Find an optimal solution using the assignment algorithm. What is the total cost of assignment?