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10CS/IS661

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Operations Research

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting at least TWO full questions from each part.*

PART – A

1   a.   Define Operation Research. Explain various phases of OR. List any three limitations of OR. **(10 Marks)**

   b.   The standard weight of a special purpose brick is 5kg and it contains two basic ingredients B_1 and B_2. B_1 costs Rs.5/kg and B_2 costs Rs. 8/kg. Strength consideration dictate that the brick contains not more than 4kg of B_1 and a minimum of 2kg of B_2. Since the demand for the product is likely to be related to the price of the brick, find graphically the minimum cost of the brick satisfying the above conditions. **(10 Marks)**

2   a.   Explain the concept of Tie breaking (Degeneracy) in simplex method. **(08 Marks)**

   b.   Solve by simplex method:
   Maximize $Z = 3x_1 + 5x_2 + 4x_3$
   Subject to: $2x_1 + 3x_2 \leq 8$
   $3x_1 + 2x_2 + 4x_3 + \leq 15$
   $2x_2 + 5x_3 \leq 10$
   and $x_1, x_2, x_3 \geq 0$ **(12 Marks)**

3   a.   Solve the following using Big M technique.
   Maximize $Z = 3x_1 + 2x_2 + x_3$
   Subject to: $-3x_1 + 2x_2 + 2x_3 = 8$
   $-3x_1 + 4x_2 + x_3 = 7$
   $x_1, x_2, x_3 \geq 0$ **(10 Marks)**

   b.   Solve the given LPP using two phase method:
   Maximize $Z = -4x_1 - 3x_2 - 9x_3$
   Subject to: $2x_1 + 4x_2 + 6x_3 \geq 15$
   $6x_1 + x_2 + 6x_3 \geq 12$
   $x_1, x_2, x_3 \geq 0$ **(10 Marks)**

4   a.   Explain the following:
   i)   The essence of duality theory.
   ii)   Primal dual relationship. **(10 Marks)**

   b.   Solve the following LPP by revised simplex method:
   Maximize $Z = 6x_1 - 2x_2 + 3x_3$
   Subject to: $2x_1 - x_2 + 2x_3 \leq 2$
   $x_1 + 4x_3 \leq 4$
   and $x_1, x_2, x_3 \geq 0$ **(10 Marks)**

PART – B

5 a. Use dual simplex method to solve the following:

Maximize $Z = -3x_1 - 2x_2$

Subject to: $x_1 + x_2 \geq 1$

$x_1 + x_2 \leq 7$

$x_1 + 2x_2 \geq 10$

$x_2 \leq 3$

and $x_1, x_2 \geq 0$ (12 Marks)

b. Briefly discuss about sensitivity analysis.   (08 Marks)

6 a. Find IBFS for the following transportation problem by   (10 Marks)
i) N-W method   ii) LCEM method   iii) VAM.

	A$_1$	B$_1$	C$_1$	D$_1$	E$_1$	Supply
A	2	11	10	3	7	4
B	1	4	7	2	1	8
C	3	9	4	8	12	9
Demand	3	3	4	5	6	

(10 Marks)

b. Solve the following assignment problem: (10 Marks)

	1	2	3	4	5
A	15	10	25	25	10
B	1	8	10	20	2
C	8	9	17	20	10
D	14	10	25	27	15
E	10	8	25	27	12

(10 Marks)

7 a. Solve the following game by using the principle of dominance: (10 Marks)

	I	II	III	IV	V	VI
1	4	2	0	2	1	1
2	4	3	1	3	2	2
3	4	3	7	-5	1	2
4	4	3	4	-1	2	2
5	4	3	3	-2	2	2

b. Define the following:
i)   Strategy
ii)   Pure strategy
iii) Mixed strategy
iv)   Optimal strategy
v)   Zero sum game.   (10 Marks)

8   Write short notes on:
a. Genetic algorithm
b. Metaheuristics
c. Tabu search algorithm
d. Simulated annealing algorithm.   (20 Marks)

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