USN | | | | | | | | | | | **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: $x_1 + x_2 \geq 1$
$\qquad\quad x_1 + x_2 \leq 7$
$\qquad\quad x_1 + 2x_2 \geq 10$
$\qquad\qquad\quad x_2 \leq 3$
and $\qquad x_1, x_2 \geq 0$ **(12 Marks)**

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

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

	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:

	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:

	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

(10 Marks)

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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