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Sr. No. 007711

December 2023

B.Tech.(EL)- VII SEMESTER

Basics of Operation Research (HSMC-05-23)

Time: 3 Hours

Max. Marks:75

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) Define feasible and infeasible solution of linear programming problem. (1.5)

(b) Define slack and surplus variables in linear programming problem. (1.5)

(c) Explain the degeneracy in linear programming problem. (1.5)

(d) Define the dual of linear programming problem. (1.5)

(e) Write the significance of dual variable in a linear programming model. (1.5)

(f) Write a short note on transportation problem. (1.5)

(g) Explain the basic logic of arrow network. (1.5)

(h) Write a short note on unbalanced assignment problem. (1.5)

(i) State Bellman's principle of optimality of dynamic programming. (1.5)

(j) Write the major importance of queuing theory. (1.5)

PART -B

Q2 (a) How the unbounded solution be recognized in the graphical method. (8)
Solve graphically, the following LPP
Maximize $Z = 15x_1 + 10x_2$
Subject to the constraints
$4x_1 + 6x_2 \le 360,\ 3x_1 + 0x_2 \le 180,\ 0x_1 + 5x_2 \le 200$ and $x_1, x_2 \ge 0$.

(b) Solve the following LPP by Simplex method (7)
Maximize $Z = 3x_1 + 2x_2$
Subject to the constraints
$x_1 + x_2 \le 4,\ x_1 - x_2 \le 2$ and $x_1, x_2 \ge 0$.

Q3 (a) Use Big-M method to solve the following: (7)
Maximize $Z = x_1 + x_2 + x_4$
Subject to the constraints
$x_1 + x_2 + x_3 + x_4 = 4,\ x_1 + 2x_2 + x_3 + x_5 = 4,\ x_1 + 2x_2 + x_3 = 4$
and $x_1, x_2, x_3, x_4, x_5 \ge 0$.

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(b) Use dual simplex method and solve (8)

Minimize $Z = x_1 + 2x_2 + 3x_3$

Subject to the constraints

$x_1 - x_2 + x_3 \geq 4,\ x_1 + x_2 + 2x_3 \leq 8,\ x_2 - x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$.

Q4 (a) Find the optimal solution of the following transportation problem. (11)

				Available
	50	30	220	1
	90	45	170	3
	250	200	50	4
Required	4	2	2	8

(b) Explain the various assumptions of PERT and CPM. (4)

Q5 (a) Explain PERT and its importance in network analysis. What are the requirements for applications of PERT techniques? (8)

(b) What is Dynamic Programming? Give its various applications. (7)

Q6 (a) What are the essential characteristics of dynamic programming? (5)

(b) Define inventory? Explain the economic order quantity model. What are its assumptions? What are the practical limitations in using this formula? (10)

Q7 (a) What is a queuing problem? Give an example and explain the basic elements of queue. (7)

(b) Give some applications of queuing theory and explain the following terms : (8)

(i) Queue **(ii)** traffic intensity **(iii)** service channel **(iv)** queue discipline

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