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2024

COMMERCE

Paper : COM-2036

**(Operations Research and
Computer in Business)**

Full Marks : 80

Time : Three hours

***The figures in the margin indicate
full marks for the questions.***

GROUP-A

(Operations Research)

1. Choose the correct alternative : $1 \times 5 = 5$

(a) Constraints in an LP model represents

(i) limitations

(ii) requirements

(iii) balancing limitations and
requirements

(iv) All of the above

Contd.

(b) The initial solution of a transportation problem can be obtained by applying any known method. However the only condition is that

- (i) the solution be optimal
- (ii) the rim conditions are satisfied
- (iii) the solution not be degenerate
- (iv) All of the above

(c) The method used for solving an assignment problem is called

- (i) MODI method
- (ii) Hungarian method
- (iii) Reduced Matrix method
- (iv) None of the above

(d) A game is said to be fair, if

- (i) both upper and lower values of the game are same and zero
- (ii) upper and lower values of the game are not equal
- (iii) upper value is more than lower value of the game
- (iv) None of the above

(e) The term 'Jockeying' in Queueing theory refers to

(i) Not entering the long queue

(ii) Leaving the queue due to impatience

(iii) Shifting from one queue to another parallel queue

(iv) None of the above

2. (a) What is linear programming ? What are its major assumptions ? 1+4=5

Or

Write the dual of the following primal problem : 5

$$\text{Max } Z = x_1 + 2x_2 + x_3$$

subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

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

- (b) Use the graphical method to solve the following LP problem : 5

$$\text{Minimize } Z = 20x_1 + 10x_2$$

subject to

$$x_1 + 2x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60$$

$$x_1, x_2 \geq 0$$

- (c) Name the methods available to obtain an initial solution of a transportation problem. Which one of them provides good initial solution and why ? How can we convert an unbalanced transportation problem into a balanced one ? 2+2+1=5

3. (a) Solve the following LPP using simplex method : 8

$$\text{Maximize } Z = 6x_1 + 8x_2$$

subject to

$$5x_1 + 10x_2 \leq 60$$

$$4x_1 + 4x_2 \leq 40$$

$$x_1, x_2 \geq 0$$

- (b) Give the mathematical formulation of an assignment problem. How does it differ from a transportation problem ?

$$3+4=7$$

Or

Solve the assignment problem where five different jobs are assigned to five different operators such that the total processing time is minimized. The matrix entries represent processing time in hours.

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		Operators				
		1	2	3	4	5
Jobs	I	10	12	15	12	8
	II	7	16	14	14	11
	III	13	14	7	9	9
	IV	12	10	11	13	10
	V	8	13	15	11	15

4. (a) What are the different elements of the queueing system ? In a supermarket, the average arrival rate of customers is 10 every 30 minutes following Poisson process. The average time taken by a cashier to list and calculate the customer's purchase is 2.5 minutes following exponential distribution.

- (i) What is the probability that the queue length exceeds 6 ?
- (ii) What is the expected time spent by a customer in the system ?

$$3+4=7$$

Or

Explain the Maximin-Minimax principle. Solve the following payoff matrix, determine the optimal strategies and value of the game :

$$3+4=7$$

$$\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$$

- (b) Determine an initial basic feasible solution to the transportation problem by using

(1) Least cost method

(2) Vogel's approximation method

$$3+5=8$$

		Destination				Supply
		1	2	3	4	
Source	1	3	1	7	4	300
	2	2	6	5	9	400
	3	8	3	3	2	500
Demand		250	350	400	200	

GROUP-B

(Computer in Business)

5. Answer *any two* : 5×2=10
- (a) What is encryption ? Explain the encryption keys. 3+2=5
- (b) Write a note on different E-commerce business models.
- (c) What is DFD ? How does it help in system analysis and design ? 2+3=5
6. Explain in detail the different kinds of authentication devices. 10
7. What is a system ? What are the elements of a system ? 3+7=10

Or

Explain the process of system development life cycle. 10
