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November-2024

B.B.A., Sem.-V

CC-304 : Operations Research and Quantitative Technique

Time : 2:30 Hours] [Max. Marks : 70

Instructions : (1) Graph paper will be provided by request.
  (2) Use of simple calculator is allowed.

1. (A) Define the following terms with example : **7**
   (1) Decision Variable
   (2) Objective Function
   (3) Constraints

   (B) Minimize $Z = 6x + 4y$ **7**
   Subject to the constraints
   $x \leq 3$
   $y \leq 3$
   $2x + 3y \geq 6$
   $x, y \geq 0$

   OR

1. (A) In a boat at the most 15 passengers and maximum 45 kg luggage can be taken. There are two types of passengers who travel in the Boat. **7**
   (i) Those who have 4 kg luggage and
   (ii) Those who have 3 kg luggage
   The ticket for a passenger with luggage of 4 kg is ₹ 5 and ticket for a passenger with luggage of 3 kg is ₹ 7. In what number of two types of passengers should be taken by the boat owner to get maximum income ?

   (B) Obtain the dual problem of the following primal LP Problem : **7**
   Minimize $Z = 5x + 3y$
   Subject to the constraint
   $2x + 4y \leq 16$
   $x - y = 3$
   $x \geq 10$
   $x, y \geq 0$

2. (A) What is the objective of transportation problem? Give mathematical formulation of transportation problem. **7**

(B) Solve the following transportation problem by Vogel's Method and obtain optimum solution : 7

	D_1	D_2	D_3	Supply
O_1	9	14	11	16
O_2	10	12	8	10
O_3	12	11	14	12
Demand	8	11	19	

OR

2. (A) Determine initial basic feasible solution to the following transportation problem by using Matrix Minima method : 7

		Destination				
		D_1	D_2	D_3	D_4	Supply
	O_1	10	20	10	40	30
Origin	O_2	30	30	20	10	50
	O_3	40	20	50	90	20
	Demand	20	40	30	10	

(B) Solve the following transportation problem by using Vogel's method and obtain optimum solution : 7

	D_1	D_2	D_3	Supply
O_1	13	17	5	20
O_2	20	6	15	22
O_3	10	25	2	18
Demand	16	21	23	

3. (A) Define the following terms with example : 7
   (1) Activity
   (2) Event
   (3) Network

(B) Prepare a PERT diagram for the following project and find Critical Path : 7

Activity	1-2	1-3	1-4	2-5	3-7	4-6	5-7	5-8	6-9	7-10	8-10	9-10
Time	10	7	8	7	14	6	8	5	4	12	13	14

OR

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3. (A) Prepare Network and find Total Float.

Activity	1-2	1-3	1-4	2-4	3-4	4-5
Days	9	8	15	5	10	2

(B) Andani Foods Ltd., has broken down the process of launching a new Fruit Yogot in the market into several steps. Some of these steps cannot begin until others are completed and these relationships are shown in the following table. Prepare network and find Critical Path.   7

Activity	A	B	C	D	E	F	G	H
Preceding Activity	–	–	–	A	C	B, E	C	G,F
Time	4	7	8	5	4	4	11	4

4. (A) Explain Hungarian Method.   7

(B) Obtain the strategies for both players and the value of the game for two-person zero sum game whose payoff matrix is given as follows :   7

		Player B					
		B_1	B_2	B_3	B_4	B_5	B_6
Player A	A_1	1	3	–1	4	2	–5
	A_2	–3	5	6	1	2	0

OR

4. (A) Kothiya Binders has five employees with five jobs to be performed. The time (in hours) each man will take to perform each job is given in the effectiveness matrix. How should the jobs be allocated, one per employee, so as to minimize the total man-hours ?   7

		Person				
		I	II	III	IV	V
Works	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

(B) Use dominance rules to reduce the size of the following payoff matrix and hence find the optimal strategies and value of the game :   7

		Player B		
		B_1	B_2	B_3
Player A	A_1	3	–2	4
	A_2	–1	4	2
	A_3	2	2	6

P.T.O.

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State whether the statements are true or false : (Any **Seven**)

(1) The constants after inequality in dual problem becomes co-efficient of the objective function in primal problem.

(2) Graphical method is used to solve a linear programming problem having more than 2 variables.

(3) If "number of allocation = m + n – 1", then it is known as degenerate solution.

(4) For a transportation matrix of order 4 × 5, there will be 8 no. of allocation for non-degenerate solution.

(5) Longest path of the network is known as Critical Path.

(6) PERT Network starts with an event and ends with an event.

(7) In transportation problem number of rows is always equal to number of columns.

(8) Dominance rule is applied in solving any assignment problem.

(9) In two-person zero sum game, gain to one player equals to the loss of other player.

(10) In two-person zero sum game, the resulting gain is known as pay-off matrix.

(11) Linear programming was first introduced by George B. Dantjing and Marshal Edworth.

(12) In North-West Corner rule, the transportation cost is totally ignored.