Seat No. : _____

MD-104

March-2025

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 Operations Research (OR) and give application of OR in various fields. **7**

(B) Max $Z = 2x + 5y$ **7**

Subject to the constraints

$x \leq 400$

$y \leq 300$

$x + y \leq 600$

$x, y \geq 0$

OR

1. (A) A manufacturer produces two types of machines. For producing machine of type A, 2 tons of iron and 200 working hours are required and for producing machine of type B, 4 tons of iron and 150 working hours are required. The manufacturer has 900 tons of iron and 60,000 working hours at his disposal. If the profit on type A machine is rupees 500 and that on type B machine is rupees 800, find how many machines of type A and B should be produced to get maximum profit. **7**

(B) Obtain the dual problem of the following primal LP Problem : **7**

Minimize $Z = 5x + 7y$

Subject to the constraint

$x + y \leq 4$

$3x + 8y \leq 24$

$5x + 2y \geq 10$

$x, y \geq 0$

2. (A) What is the objective of Transportation Problem and explain North West Corner Method. **7**

(B) Solve the following transportation problem by North West Corner Method. **7**

	D_1	D_2	D_3	Supply
O_1	50	60	70	6
O_2	120	80	40	10
O_3	30	100	140	3
Demand	10	4	5	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
Origin	O_1	30	60	20	120	30
	O_2	90	70	60	30	50
	O_3	120	60	150	270	20
	Demand	20	40	30	10	100

(B) Solve the following transportation problem by using Vogel's method. **7**

	D_1	D_2	D_3	Supply
O_1	1500	1300	3300	1
O_2	1900	1450	2700	3
O_3	3500	3000	1500	5
Demand	4	2	3	9

3. (A) State rules for constructing a network. **7**

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

Activity	1-2	2-3	2-4	3-4	4-5
Time	15	5	9	8	13

OR

3. (A) Prepare Network and find EST and EFT. **7**

Activity	1-2	2-3	3-4	2-5	5-6	4-7	6-7	7-8
Days	30	40	60	80	100	70	110	50

(B) Prepare Network and find Critical Path. **7**

Activity	1-2	1-3	1-4	2-3	2-5	3-5	4-5
Time (hours)	40	20	50	70	70	20	50

4. (A) Explain Hungarian Method. **7**

(B) Solve the following game : **7**

	Player B		
Player A	15	2	3
	6	5	7
	–7	4	0

OR

4. (A) Player A and B toss a dice. If even number occurs on both dice, player A gets ₹ 8; If odd number occurs on both dice, player A gets ₹ 6. If one gets odd and other gets even, player B gets ₹ 5; Determine the best strategy for each player. **7**

(B) Assign different jobs to different persons so that the total time is minimum. **7**

		Jobs			
		P	**Q**	**R**	**S**
Persons	**A**	12	15	18	8
	B	13	10	9	14
	C	10	12	15	13
	D	7	8	9	14

5. State whether the statements are true or false : (Any **Seven**) (Write in Sequence) **14**

(1) The objective function in an LPP must always be linear.

(2) The graphical method can be used to solve LPPs with more than two decision variables.

(3) In LPP, a constraint can be an equality or an inequality.

(4) The total supply must equal the total demand in a balanced transportation problem.

(5) The Matrix Minima Method does not consider the cost while making allocations.

(6) The North West Corner Method selects the highest cost cell for the first allocation.

(7) The critical path is the longest path in the network and determines the shortest project completion time.

(8) A project cannot have more than one critical path.

(9) The expected project duration in PERT is calculated using the formula $\frac{t_0 + 4t_m + t_p}{4}$.

(10) A saddle point in a payoff matrix represents the optimal strategy for both players.

(11) The objective of the assignment problem is to minimize cost or maximize profit.

(12) In an assignment problem, each task can be assigned to multiple workers simultaneously.
