Seat No:_____ Enrollment No:_____

PARUL UNIVERSITY

FACULTY OF MANAGEMENT

BBA Summer 2022-23 Examination

Semester: 5 **Date: 27/03/2023**
Subject Code: 06191306 **Time: 2.00pm to 4.30pm**
Subject Name: Operations Research **Total Marks: 60**

Instructions

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Do as Directed.

A). Multiple choice type questions/Fill in the blanks. (Each of 1 mark) **(05)**

1. For maximization LP model, the simplex method is terminated when all values
   a) $c_j - z_j \leq 0$ c) $c_j - z_j \geq 0$
   b) $c_j - z_j = 0$ d) $z_j \leq 0$
2. The method used for solving an assignment problem is called
   a) reduced matrix method c) Hungarian Method
   b) MODI method d) None of the above
3. The purpose of a dummy row or column in an assignment problem is to
   a) obtain balance between total activities and total resources c) prevent a solution from becoming degenerate
   b) provide a means of representing a dummy program d) None of above
4. To convert ≥ inequality constrains into equality constrains, we must
   a) add a surplus variable c) subtract an artificial variable
   b) subtract a surplus variable and an artificial variable d) add a surplus variable and subtract an artificial variable
5. The group replacement policy is suitable for identical low cost items which are likely to
   a) fail over a period of time c) fail completely and suddenly
   b) fail suddenly d) none of the above

B). Define the following. (Each of 1 mark) **(05)**

1. Give definition of Event float.
2. If 12% is the rate of interest and n is 10 then find Present Worth Factor.
3. Give the definition of two person zero sum game.
4. In the assignment problem the number of allocation in each row or column are _____.
5. Find Saddle point of following payoff matrix.
   $\begin{bmatrix} -1 & 2 & -2 \\ 6 & 4 & -6 \end{bmatrix}$

C). Direct questions. (Each of 1 mark) **(05)**

1. For an activity of a project the optimistic time is 5 hours, pessimistic time is 12 hours and the most likely time is 10 hours. Find the expected time of the activity.
2. Give definition of EST.
3. The solution to the transportation problem with m-row and n-columns is feasible if number of positive allocations are _____
4. Give the definition of Unbalance transportation problem.
5. The number of lines drawn is equal to the number of rows the current solution is call _____ solution.

Q.2 Answer the following questions.

A). The data collected in running a machine, the cost of which is 60000rs.are given below. Determine the optimal period for replacement of the machine. **(07)**

Year	1	2	3	4	5
Resale value(Rs.)	42000	30000	20400	14400	9650
Cost of spares(Rs.)	4000	4270	4880	5700	6800
Cost of labours(Rs.)	14000	16000	18000	21000	25000

B). 1. Give the difference between PERT and CPM. **(04)**

2. Obtain the optimal strategies for both persons and the value of the game for two persons zero sum game whose payoff matrix is as follows **(04)**

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{bmatrix}$$

Q.3 Answer the following questions.

A). Solve Linear programming problem by Simplex method: **(07)**

$$Maximize\ Z = 50x_1 + 70x_2$$
$$Subject\ to\ x_1 + x_2 \leq 70$$
$$x_1 + 2x_2 \leq 100$$
$$2x_1 + x_2 \leq 120\ ,\quad x_1, x_2 \geq 0\ .$$

B). 1. A national car service has a surplus of one car in each of the cities A,B,C,D,E,F and requirement of one car in each of the cities P,Q,R,S,T and U. The distance (in kms) between cities with a surplus and cities with requirement are given in the matrix below. How should the cars be dispatched so as minimize the total distance travelled? **(05)**

	P	Q	R	S	T	U
A	41	62	39	52	25	51
B	22	29	49	65	81	50
C	27	29	60	51	32	32
D	45	50	48	52	37	43
E	29	40	39	26	30	33
F	82	40	40	60	51	30

2. Obtain feasible solution of transportation problem by North West Corner method. **(03)**

Origin	Destinations				
	P	Q	R	S	Supply
A	7	5	2	6	13
B	9	10	3	8	17
C	5	4	7	3	5
Demand	5	11	15	4	

Q.4 Attempt any two questions. (Each of 7.5 mark) **(15)**

1. Solve *Linear programming problem*

$$Maximize\ Z = -2x - y$$
$$Subject\ to\ 3x + y = 3$$
$$4x + 3y \geq 6$$
$$x + 2y \leq 4\ \ with\ x, y \geq 0.$$

2. Obtain optimal solution the following transportation problem for maximum profit.

Origin	Sales Centre				
	P	Q	R	S	Supply
A	40	25	22	33	100
B	44	35	30	30	30
C	38	38	28	30	70
Demand	40	20	60	30	

3.Player A and B play a game in which each has three coins, a 5 p,10 p and 20 p. Each selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, then A wins B's coin. But if the sum is even then B wins A's coin. Find the best strategy for each player and the values of the game.

4. Represent the following information in form of a network. Find expected time of each activity and obtain the critical path.

Activity	Most Likely Time(in hours)	Optimistic Time(in hours)	Pessimistic Time(in hours)
1-2	4	9	14
2-3	1	5	18
2-4	8	10	17
3-5	3	6	8
4-5	2	4	5
4-6	3	7	10
5-7	3	7	10
5-8	4	8	9
7-9	4	9	14
8-9	2	6	10
9-10	4	11	18
6-10	4	7	9