

**PARUL UNIVERSITY**  
**FACULTY OF MANAGEMENT**  
**BBA, Winter 2017 - 18 Examination**

**Semester: 5**  
**Subject Code: Operations Research**  
**Subject Name: 06191306**

**Date: 30/12/2017**  
**Time: 2:00pm to 4:30pm**  
**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.****(05)**

1. At every iteration of simplex method, for minimization problem, a variable in the current basis is replaced with another variable that has
 

a) a positive $c_j - z_j$ value	c) $c_j - z_j = 0$
b) a negative $c_j - z_j$ value	d) all above these
2. Which of the following method is used to verify optimality of current solution of transportation problem.
 

a) North-west corner method	c) Matrix minima
b) Vogel's Approximation method	d) Modified Distribution (MODI) method
3. The method used for solving assignment problem is called
 

a) Least cost method	c) Modified Distribution (MODI) method
b) Hungarian method	d) Vogel's Approximation method
4. What happens Minmax and Maxmin values of the game are same?
 

a) No solution exists	c) Saddle point exists
b) Solution is mixed	d) None of above
5. An event is said to be critical event if
 

a) $L_i - E_i \neq 0$	c) $L_i - E_i = 0$
b) $L_i < E_i$	d) $L_i > E_i$

**B) Define the following.****(05)**

1. Define the term Unbounded solution.
2. Define the term Unbalanced assignment problem.
3. Define the term Gradual failure.
4. Define the term Sudden failure.
5. Define the term Mixed strategy.

**C) Direct questions.****(05)**

1. Write necessary and sufficient condition for transportation problem.
2. Write full form of CPM and PERT.
3. Which method is used to reduce the size of payoff matrix?
4. An optimal solution of an assignment problem can be obtained if each row and column has only one zero element. (True/ False)
5. Simplex method is used to remove artificial variable from the basis. (True/False)

**Q.2 Answer the following questions.**

- A) 1. A department of a company has five employees with five jobs to be performed. The time that each man takes to perform each job is given effectiveness matrix. (04)

Jobs	Employees				
	I	II	III	IV	V
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

(03)

2. Explain Maxmin and Minmax principle used in game theory.

- B) 1. Determine value of game and best strategies for each player. (04)

Player A	Player B				
	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>
A <sub>1</sub>	2	4	3	8	4
A <sub>2</sub>	5	6	3	7	8
A <sub>3</sub>	6	7	9	8	7
A <sub>4</sub>	4	2	8	4	3

2. Obtain initial basic feasible solution by North- West corner method.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S <sub>1</sub>	19	30	50	10	7
S <sub>2</sub>	70	30	40	60	9
S <sub>3</sub>	40	8	70	20	18
Demand	5	8	7	14	34

(04)

**Q.3 Answer the following questions.**

- A) 1. Find optimal assignment of the following problem. The figures indicate time different persons take to perform different jobs. Person C cannot perform Job R. (04)

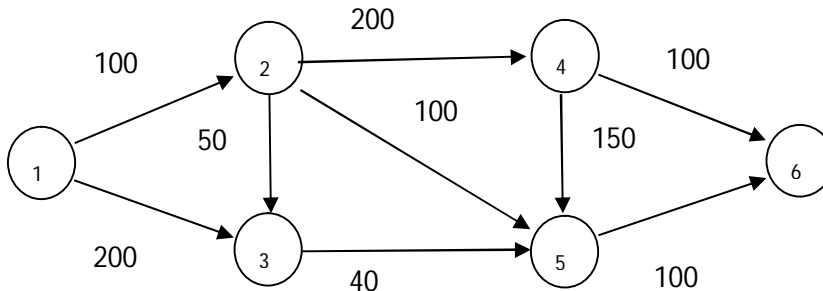
Person	Jobs			
	P	Q	R	S
A	12	13	16	20
B	15	15	14	18
C	16	20	-	14
D	18	22	18	20

2. Write a short note on Degeneracy in Transportation Problems. (03)

- B) 1. Apply dominance rule to solve the following game and hence find the optimal strategy and value of game. (04)

Player A	Player B		
	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
A <sub>1</sub>	1	7	2
A <sub>2</sub>	6	2	7
A <sub>3</sub>	5	1	6

2. Using Dijkstra's algorithm, find shortest route from node 1 to node 6. (04)



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

**(15)**

1. 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 machines of type B, 4 tons of iron and 150 working hours are required. The maximum manufacturer has 900 tons of iron and 60,000 working hours are maximum. If the profit on type A machine of rupees 500 and that on type B machine is rupees 800.

- Formulate this problem LP model as maximize profit.
- Solve the problem by graphically.

2. Find the Optimal solution of transportation problem.

	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	Supply
S <sub>1</sub>	8	9	6	3	19
S <sub>2</sub>	6	11	5	10	12
S <sub>3</sub>	3	8	7	9	14
Demand	15	6	11	13	

3. A large establishment has an installation with 1,000 bulbs of a certain type. From the past data it has observed that failure rates of bulbs as detailed here:

End of week	1	2	3	4	5
Probability of failure to date	0.10	0.25	0.50	0.70	1.00

It is given that the cost of replacing an individual bulb is Rs 3 while if the entire group of bulbs is replaced, the cost would be Rs 1 per bulb. Determine optimal time period for replacement.

4. Represent following information as network diagram.

Activity	A	B	C	D	E	F
Sequence	1-2	1-3	2-3	2-4	3-4	4-5
Time	20	25	10	12	5	10

- Find Earliest and latest expected completion times for each activity.
- Find critical path.
- Calculate total float and free float for non-critical activity.