

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2018 - 19 Examination**

**Semester: 6**  
**Subject Code: 03113380**  
**Subject Name: Operational Research**

**Date: 09/05/2019**  
**Time: 10:30am to 1:00pm**  
**Total Marks: 60**

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**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 Objective Type Questions - (All are compulsory) (Each of one mark) (15)**

1. In simplex problem for maximization, the key column contains
  - A. Maximum positive Net Evaluation value ( $C_j - Z_j$ )
  - B. Maximum negative Net Evaluation value ( $C_j - Z_j$ )
  - C. Infinity
  - D. Zero
2. Which of the following method is used to optimize the initial basic feasible solution found out in transportation problem?
  - A. North-West corner method
  - B. Column minima method
  - C. Vogel's approximation method
  - D. MODI method
3. Which of the following is untrue for assignment problem?
  - A. It can minimize the cost
  - B. It can be used in scheduling
  - C. It can be used in allocating
  - D. Assignment model can only be used if the number of facilities and number of jobs are different.
4. Which of the following method uses three time estimates namely optimistic, pessimistic and most likely?
  - A. PERT
  - B. CPM
  - C. Beta distribution
  - D. Simplex
5. Which of the following is not a criterion for decision making under uncertainty?
  - A. Maximax
  - B. Minimax
  - C. Direct allocation
  - D. Laplace
6. What is optimization?
7. What is basic feasible solution in transportation problem?
8. What is arrival distribution in queuing theory?
9. What is inventory control?
10. What is critical path method?
11. When should the replacement of the items that deteriorate be done?
12. What is Hurwicz criterion of decision making?
13. What is project scheduling?
14. What is the difference between assignment and transportation problem?
15. What is critical path for any project (containing numerous activities and events)?

**Q.2 Answer the following questions. (Attempt any three) (15)**

- A) An advertising company is deciding its advertising strategy in three different media namely television, radio and magazine. The purpose of advertising is to reach as many customers as possible. Following data has been obtained from market survey. The company wants to spend more than Rs. 450000 on advertising with following further requirements that must be met.
1. At least 1 million exposures take place among female customers.
  2. Advertising on magazines be limited to 150000.
  3. At least 3 advertising unit be bought on magazine I and 2 units on magazine II.

4. The number of advertising units on television and radio should each be between 5 and 10. Formulate an LP (Linear Programming) model for this problem.

	Television	Radio	Magazine I	Magazine II
Cost of an advertising unit	₹ 30,000	₹ 20,000	₹ 15,000	₹ 10,000
No. of potential customers reached per unit	2,00,000	6,00,000	1,50,000	1,00,000
No. of female customers reached per unit	1,50,000	4,00,000	70,000	50,000

B) The information regarding the jobs to be scheduled through one machine is given below

Job	:	A	B	C	D	E	F	G
Processing time (days)	:	4	12	2	11	10	3	6
Due date (days)	:	20	30	15	16	18	5	9

1. What is the first come, first served schedule?
2. What is shortest processing time schedule?

C) Explain the following decision making environments

1. Decision making under condition of risk
2. Decision making under conditions of conflict

D) Explain project controlling and project planning.

Q.3 A) Find the initial basic feasible solution of following transportation problem by Vogel's approximation method. (07)

		Stores (destinations)							Surplus (supply)
		1	2	3	4	5	6		
Warehouses (origins)	1	9	12	9	6	9	10	5	
	2	7	3	7	7	5	5	6	
	3	6	5	9	11	3	11	2	
	4	6	8	11	2	2	10	9	
	Requirement (demand)	4	4	6	2	4	2		

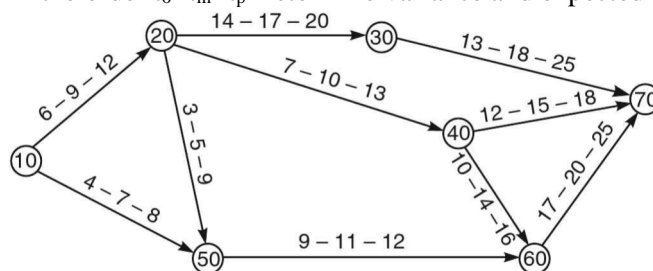
B) Explain following elements of queuing theory (08)

1. Service discipline
2. Calling source or population
3. Customer's behavior
4. Service distribution

OR

B) Write down reasons for maintaining inventory. Discuss direct and indirect inventories. (08)

Q.4 A) Consider the network shown. For each activity, three time estimates  $t_o$ ,  $t_m$  and  $t_p$  are given along the arrows on the line in the order  $t_o$ -  $t_m$ -  $t_p$ . Determine variance and expected time for each activity. (07)



OR

A) The cost of a machine is Rs. 6100 and its scrap value is Rs. 100. Maintenance costs found from experience are as follows. When should the machine be replaced? (07)

Year	1	2	3	4	5	6	7	8
Maintenance cost (₹)	100	250	400	600	900	1,200	1,600	2,000

B) Solve following problem by simplex method (08)

$$Z_{\max} = 4x_1 + 3x_2 + 6x_3$$

$$\text{Subjected to } 2x_1 + 3x_2 + 2x_3 \leq 440$$

$$4x_1 + 3x_3 \leq 470$$

$$2x_1 + 5x_2 \leq 430$$