

Code No: 821AJ

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****MCA II Semester Examinations, April/May - 2019****OPERATIONS RESEARCH****Time: 3hrs****Max.Marks:75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A****5 × 5 Marks = 25**

- 1.a) Define feasible, Infeasible solution and no solution. [5]
- b) State the mathematical formulation for T.P. [5]
- c) List two uses of replacement model. [5]
- d) Explain minimax principle used in the theory of games. [5]
- e) Explain characteristics and classification of queuing models. [5]

**PART - B****5 × 10 Marks = 50**

- 2.a) The ABC Company has been a producer of picture tubes for television sets and certain printed circuits for radios. The company has just explained into full scale production and marketing of AM and AM-FM radios. It has built a new plant that can operate 48 hours per week. Production of an AM radio in the new plant will require 2 hours and production of an AM-FM radio will require 3 hours. Each AM radio will contribute Rs. 40 to profits while an AM-FM radio will contribute Rs. 80 to profits. The marketing departments, after extensive research, have determined that a maximum of 15 AM radios and 10 AM-FM radios can be sold each week. Formulate the LPP.

- b) Solve by Big M method

Maximize  $Z = 3x_1 - x_2$ 

Subject to

$$2x_1 + x_2 \geq 2,$$

$$x_1 + 3x_2 \leq 3,$$

$$x_1, x_2 \geq 0$$

[5+5]

**OR**

- 3.a) Write the steps for solving Linear Programming Problem by Graphical method. State its limitations.

- b) Solve the following LP problems graphically

Minimize  $Z = 3x_1 + 2x_2$ 

Subject to

$$5x_1 + x_2 \geq 10,$$

$$x_1 + x_2 \geq 6,$$

$$x_1 + 4x_2 \geq 12$$

$$x_1, x_2 \geq 0$$

[5+5]

4. Determine an IBFS by Vogel's Approximation method and also find the optimum solution.

Source	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

[10]

**OR**

5. A departmental has five employees with five jobs to be performed. The time (in hours) each men 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.

	Employees				
jobs	1	2	3	4	5
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

[10]

6. Machine B costs Rs.10,000. Annual operating costs are Rs.400 for the first year, and then increased by Rs.800 every year. You know have a machine of type A which is one year old. Should you replace it with B, if so, when?

[10]

**OR**

7. The following failure rates have been observed for a certain type of light bulbs:

End of the week	:	1	2	3	4	5	6	7	8
Probability	:	0.05	0.13	0.25	0.43	0.68	0.88	0.96	1.00

The cost of replacing an individual failed bulb is Rs.1.50. The decision is made to replace all bulbs simultaneously at fixed intervals, and also to replace individual bulbs as they fail in service. If the cost of group replacement is 30 paise per bulb, what is the best interval between group replacements? At what group replacement price per bulb would a policy of strictly individual replacement become preferable to the adopted policy?

[10]

- 8.a) Explain Principal of optimality, state and stage in the context of dynamic programming.  
 b) Solve the following Two-person zero sum game using graphical technique [5+5]

		Player B	
		I	II
Player A	I	2	-4
	II	-1	6
	III	3	5
	IV	4	1
	V	3	4
	VI	-7	6

**OR**

9. Use dominance property to reduce the game to  $2 \times 2$  game and hence find optimal strategies.

		Player B			
		I	II	III	IV
Player A	I	5	-10	9	0
	II	6	7	8	1
	III	8	7	15	1
	IV	3	4	-1	4

[10]

- 10.a) A company uses annually 48,000 units of a raw material costing Rs.120/- unit placing each order costs Rs.45/- carrying cost is 1.5% per year of the average inventory. Find E.O.Q and minimum cost.
- b) A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time, find
- Average number of customers in the system.
  - Average number of customers in the queue or average queue length.

[5+5]

**OR**

- 11.a) A motor manufacturing company purchases 10,000 items of certain motor parts for its annual requirements, ordering one month usage at a time. Each spare costs Rs.20, the Ordering cost per order if Rs.15 and carrying charges are 10% of the unit item cost per year. Make a more economical purchasing policy.
- b) A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed) the typing rate is randomly distributed approximating of Poisson distribution with mean rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8-hour work day. If the typewriter is valued at Rs. 1.50 per hour, determine
- Equipment utilization
  - The percent time that an arriving letter has to wait.

[5+5]

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