Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester:8 **Date: 29/04/2019**
Subject Code: 03109451 **Time:10:30am to 01;00pm**
Subject Name: Operation Research and Optimization Techniques **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 **Objective Type Questions -** (All are compulsory) (Each of one mark) **(15)**

Fill in the blanks.

1. The rules of _____ are used to reduce the size of the pay off matrix.
2. Five computer programmers are to be given the five program to develop with minimum time, _____ _model is used to solve the problem.
3. The solution to a transportation problem with 'm' rows and 'n' columns is IBFS if number of allocations are _____.
4. Graphical method can be applied to solve a LPP when there are only _____ variables.
5. _____ variable is used for ≤ type of inequality.

Answer in one sentence/word

6. List the phases of Operation Research.
7. What do you understand by inventory?
8. What are the reasons of replacement of an Automobile?
9. Define Operations Research.
10. What is the full form of EOQ?

Choose the correct answer from the multiple choice.

11. _____ are expressed is in the form of inequalities or equations.
    a. Constraints b. Objective Function
    c. Decision Variable d. All of the above
12. One disadvantage of using North-West Corner rule to find initial solution to the transportation problem is that
    a. It is complicated to use b. It leads to a degenerate initial solution
    c. It does not take into account cost of transportation d. All of the above
13. The method used for solving an assignment problem is called.
    a. Hungarian method b. Reduced matrix method
    c. MODI method d. Least Cost Method
14. Queuing theory is applicable to
    a. Railway station b. Petrol Pump
    c. Banking d. All of the above
15. The best use of linear programming technique is to find an optimal use of
    a. Money b. Manpower
    c. Machine d. All of the above

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

A) Consider a problem of assigning four clerks to four tasks. The time (hours) required to complete the task is given below:

		Tasks			
		A	**B**	**C**	**D**
Clerks	**1**	4	7	5	6
	2	-	8	7	4
	3	3	-	5	3
	4	6	6	4	2

Clerk 2 cannot be assigned task A and clerk 3 cannot be assigned task B. Compute the optimum assignment schedule.

B) A firm manufactures two product A & B on which the profit earned per unit are Rs. 3 and Rs.4, respectively. Each product is processed on two machines M1 and M2. Product A requires one minute of processing time on M1 and two minutes on M2, while product B requires one minute

of processing time on M1 and one minute on M2. Machine M1 is available for not more than 7 hrs and 30 minutes, while machine M2 is available for 10hrs during any working day. Construct the problem as LPP.

C) Describe a note on application of Operation Research in Industry.

D) Apply the graphical method to solve the following LP problem.

Maximize $Z= 15X_1+10X_2$

Subject to the constraints

(i) $4X_1 + 6X_2 \leq 360$,

(ii) $3X_1 \leq 180$,

(iii) $5X_2 \leq 200$,

(iv) $X_1, X_2 \geq 0$

Q.3 A) A steel company has three open hearth furnaces and five rolling mills. The transportation costs (rupees per quintal) for shipping steel from furnaces to rolling mills are given in the following table. **(07)**

	M_1	M_2	M_3	M_4	M_5	**Supply**
F_1	4	2	3	2	6	**8**
F_2	5	4	5	2	1	**10**
F_3	6	5	4	7	7	**12**
Demand	**4**	**4**	**6**	**8**	**8**	

Estimate the optimal shipping schedule?

B) (i) Elaborate ABC Analysis **(08)**

(ii) Explain the application of optimization in Engineering

OR

B) Compute the optimal strategies for both persons and the value of the game for two-person zero-sum game whose payoff matrix is as follows: **(08)**

	Player B	
Player A	B_1	B_2
A_1	1	-3
A_2	3	5
A_3	-1	6
A_4	4	1
A_5	2	2
A_6	5	0

Q.4 A) A road transport company has one reservation clerk on duty at a time. He handles information of bus schedules and makes reservations. Customers arrive at a rate of 8 per hour and the clerk can, on an average, service 12 customers per hour. After stating your assumptions, answer the following: **(07)**

(a) What is the average number of customers waiting for the service of the clerk?

(b) What is the average time a customer has to wait before being served?

(c) The management is planning to install a computer system for handling information and reservations.

This is expected to reduce the service time from 5 to 3 minutes. The additional cost of having the new system works out to Rs 50 per day. If the cost of goodwill of having to wait is estimated to be 12 paise, per minute spent waiting, before being served, should the company install the computer system? Assume an 8 hours working day.

OR

A) The following mortality rates have been observed for a certain type of fuse: **(07)**

Week	1	2	3	4	5
% failing by the end of week	5	15	35	57	100

There are 1000 fuses in use and it costs Rs. 5 to replace an individual fuse. If all fuses were replaced simultaneously it would cost Rs. 1.25 per fuse. It is proposed to replace all fuses at fixed intervals of time, whether or not they have burnt out, and to continue replacing burnt out fuses as they fail. At what time intervals should the group replacement be made? Also prove that this optimal policy is superior to the straight forward policy of replacing each fuse only when it fails. Identify the policy of replacement.

B) Infer the value of objective function for following LPP. **(08)**

Maximize $Z=2x_1+3x_2+4x_3$

Subject to constraints

(i) $3x_1+x_2+4x_3 \leq 600$,

(ii) $2x_1+4x_2+2x_3 \geq 480$,

(iii) $2x_1+3x_2+3x_3 = 540$
$x_1, x_2, x_3 \geq 0$