Seat No.: _____ *Enrollment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

MBA – SEMESTER II • EXAMINATION – SUMMER 2015

Subject Code: 2820007 **Date: 16/05/ 2015**

Subject Name: Quantitative Analysis II (QA-II)

Time:10.30 AM TO 01.30 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Answer the following multiple choice questions. **06**

1. Operations Research problems are typically based on the use of _____
   A. Iconic model B. Descriptive model
   C. Mathematical model D. Physical model
2. Which technique is used to imitate an operation prior to actual performance?
   A. Simulation B. Markov Chain Analysis
   C. Goal Programming D. Network Model
3. In linear programming graphical method can be applied when there is/are only _____variable(s).
   A. One B. Two
   C. Three D. Four
4. People possess varying abilities for performing different jobs and the cost of performing those jobs by different people are different. Which operation research technique would be applied to solve the problem?
   A. Queuing Theory B. Integer Programming
   C. Transportation Problem D. Assignment Problem
5. To Find a solution for optimizing a given objective, such as profit maximization or cost minimization under certain constraints, which technique is used?
   A. Assignment Problem B. Linear Programming
   C. Duality D. Transportation Problem
6. A constraint is termed as _____ if the left hand side and right hand sides of it are equal when optimal values of decision variables are substituted into the constraint.
   A. Bounding Constraint B. Non Binding Constraint
   C. Redundant Constraint D. Binding Constraint

Q.1 (b) Explain the terms with example: **04**

1. Absorbing state probability
2. Unbounded solution
3. Simulation
4. Preemptive Goal Programming

Q.1 (c) Explain the assumptions as well as applications of Queuing theory. **04**

Q.2 (a) 'Every linear programming problem has a mirror image in the form of another linear programming problem, called its dual.' Do you agree? Explain the primal-dual relationship in detail with an example. **07**

(b) Suppose that new razor blades were introduced in the market by two companies at **07**

the same time. When they were introduced, each company had an equal share of the market, but during the first year the following changes took place:

1. Company A retained 90 % of its customers, lost 10 % to B.
2. Company B retained 80 % of its customers, lost 20 % to A.

ial market share of A & B are 30% and 70% respectively. Assuming that no changes in the buying habits of the customer occur,

1. What are the market shares of two companies at the end of first year and the second year?
2. What are the long run market shares of the two companies?

OR

(b) A company manufactures 3 types of parts which use precious metals - platinum and gold. Due to shortage of these precious metals, the government regulates the amount that may be used per day. The relevant data with respect to supply, requirements, and profits are summarised in the table as follows: **07**

Product	Platinum required/unit(gms)	Gold required/unit(gms)	Profit/unit(Rs)
A	2	3	500
B	4	2	600
C	6	4	1200

Daily allotment of platinum and gold are 160 gm and 120 gm respectively. How should the company divide the supply of scarce precious metals? Formulate it as a linear programming problem and solve by graphical method.

Q.3 (a) Explain the similarities and differences between Linear programming problem, Integer programming problem and Goal programming problem. **07**

(b) A firm produces two products P and Q, which yield a contribution margin of Rs 200 and 300 per unit, respectively. The firm has a limited capacity in the two departments where these products need processing. The availability and requirements are given below: **07**

Department	Processing Time (hours)		Daily Availability (hours)
	Product P	Product Q	
I	4	2	45
II	4	4	70

The management of the firm has specified the following goals:

Goal	Priority
Produce a product-mix to make a daily profit of at least Rs 4800	P1
Achieve a daily sales of at least 15 units of product Q	P2
Achieve a daily sales of at least 5 units of product P	P3
Formulate it as goal programming problem.	

OR

Q.3 (a) State the network model techniques and describe the methodology for minimum spanning tree. **07**

(b) A company has four sales representatives who are to be assigned to four different sales territories. The monthly sales increase estimated for each sales representative for different sales territories(in lakh rupees), is shown in the following table: **07**

Sales Representatives	Sales Territories			
	I	II	III	IV
A	200	150	170	220
B	160	120	150	140
C	190	195	190	200
D	180	175	160	190

1. Suggest optimal assignment and the total maximum sales increase per month.
2. If for certain reasons, sales representative B cannot be assigned to sales territory III, will the optimal assignment schedule be different? If so, find that schedule and the effect on total sales.

Q.4 **(a)** Explain basic concepts of sensitivity analysis. What are different factors affecting given solutions and how do we resolve them? Give a brief comment on each of them. **07**

(b) Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean 3 minutes. Find **07**

1. The probability that an arrival finds that four persons are waiting for their turn
2. The average number of persons waiting and making telephone calls
3. The expected time that a person is waiting and making a telephone call.
4. The average length of non empty queue that is formed from time to time.
5. The expected time that a person wait in the queue to make a telephone call
6. The average number of persons waiting to make a telephone call

OR

Q.4 **(a)** Describe Monte Carlo Simulation and explain the application of simulation in business environment. **07**

(b) Obtain the dual of the given LPP: **07**

Maximize $Z = 8x_1+10x_2+5x_3$

Subject to $x_1 - x_3 \leq 4$

$2x_1+4x_2 \leq 12$

$x_1+x_2+x_3 \geq 2$

$3x_1+2x_2-x_3= 8$

$x_1,x_2,x_3 \geq 0$

Q.5 A company has 3 factories manufacturing the same product and sale agencies in different parts of the country. Production costs differ from factory to factory and the sale prices from agency to agency. The shipping cost per unit product from each factory to each agency is known. Given the following data, get the initial basic solution by Vogel's Approximation Method & find the optimal production and distribution schedules most profitable to the company. **14**

Factory	Production cost/unit(Rs.)	Max. capacity (No. of units)
1	18	140
2	20	190
3	16	115

Shipping cost from factory:

Factory	Agency				
	1	2	3	4	5
1	2	2	6	10	5
2	10	8	9	4	7
3	5	6	4	3	8

For agency:

Agency	1	2	3	4	5
Demand	74	94	69	39	119
Sales price(Rs.)	35	37	36	39	34

OR

Q.5 The management of ABC company is considering the question of marketing a new product. The fixed cost required in the project is Rs 4000. The factors are uncertain, viz. the selling price, variable cost and the annual sales volume. The product has a life of only one year. The management has the data on these three factors as under: **14**

Selling Price (Rs)	Probability	Variable Cost(Rs)	Probability	Sales volume (units)	Probability
3	0.2	1	0.3	2000	0.3
4	0.5	2	0.6	3000	0.3
5	0.3	3	0.1	5000	0.4

Consider the following sequence of thirty random numbers:
81, 32, 60, 04, 46, 31, 67, 25, 24, 10, 40, 02, 39, 68, 08, 59, 66, 90, 12, 64, 79, 31, 86, 68, 82, 89, 25, 11, 98, 16

Using the sequence (first three numbers for the first trial and so on), simulate the average profit for the above project on the basis of 10 trials.

If the fixed cost required in project is Rs 5000, will be there any change in the simulation.

****