

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**MBA – SEMESTER- 02 – • EXAMINATION – WINTER 2016**

**Subject Code: 2820007**

**Date: 24/10/2016**

**Subject Name: Quantitative Analysis – II (QA – II)**

**Time: 10:30 am to 1:30 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.

6

- 1 If your goal was to construct a network in which all points were connected and the distance between them was as short as possible, the technique that you would use is
  - A) shortest-route.
  - B) maximal-flow.
  - C) minimal-flow.
  - D) minimal-spanning tree.
- 2 Assume that we are using a waiting line model to analyze the number of service technicians required to maintain machines in a factory. Our goal should be to
  - A) maximize productivity of the technicians.
  - B) minimize the number of machines needing repair.
  - C) minimize the downtime for individual machines.
  - D) minimize the total cost (cost of maintenance plus cost of downtime).
- 3 The following is not an advantage of simulation:
  - A) It allows for the study of *what-if* questions.
  - B) It allows time compression.
  - C) It allows the study of interaction of components or variables to determine which are important.
  - D) Each simulation model is unique.
- 4 Markov analysis is a technique that deals with the probabilities of future occurrences by
  - A) using the simplex solution method.

- B) the minimal spanning tree.
  - C) statistical sampling.
  - D) analyzing currently known probabilities.
- 5 The selection of specific media from among a wide variety of alternatives is the type of LP problem known as
- A) the product mix problem.
  - B) the investment banker problem.
  - C) the Wall Street problem.
  - D) None of the above
- 6 Typical resources of an organization include \_\_\_\_\_.
- A) machinery usage
  - B) labor volume
  - C) warehouse space utilization
  - D) All of the above

Q. 1 (b) Identify which of the following statements are true or false. 4

- 1 Resource restrictions are called constraints.
- 2 Transportation and assignment problems are really linear programming techniques called network flow problems.
- 3 If conditions require that all decision variables must have an integer solution, then the class of problem described is an integer programming problem.
- 4 The maximal-flow technique would be helpful to city planners in determining how freeways should be expanded.

Q. 1 (c) Define following with reference to Linear Programming. 4

- 1. Proportionality
- 2. Additivity
- 3. Continuity
- 4. Certainty

Q. 2 (a) The PetGroom Company manufactures climate-controlled doghouses. The company believes that its high-volume customers are high-income male and female dog owners who want to pamper their pets. To reach these groups, the marketing manager at PetGroom is considering placing one-minute commercials on the following national TV shows on colors channel: “24” and “Jhalak Dikhala Jha.” 7

A one-minute commercial on “24” costs Rs. 200,000, and a one-minute commercial on “Jhalak Dikhala Jha” costs Rs. 50,000. The marketing manager would like the commercials to be seen by at least 60 million high-income women and at least 36 million high-income men. Marketing studies show the following:

- Each one-minute commercial on “24” is seen by six million high-income women and two million high-income men.
- Each one-minute commercial on “Jhalak Dikhala Jha” is seen by three million high-income women and three million high-income men.

Formulate as LPP and solve Graphically the minimum cost associated with advertisement.

Q. 2 (b) Construct the dual of the following problem: 7

Maximize:  $Z = 7X_1 + 5X_2 - 2X_3$

Subject to

$$X_1 + X_2 + 3X_3 = 10$$

$$2X_1 - X_2 + 3X_3 \leq 16$$

$$3X_1 + X_2 - 2X_3 \geq 0$$

$X_1 \geq 0, X_2 \geq 0, X_3$  Unrestricted in Sign

**OR**

Q. 2 (b) Explain complete enumeration method of solving an assignment problem. 7

Q. 3 (a) Explain symmetrical relationship between Primal and Dual. 7

Q. 3 (b) Explain multiple servers – Infinite population Queuing model in detail. 7

**OR**

Q. 3 (a) A steel company has 3 open hearth furnaces and five rolling mills. 7

Transportation cost (Rs. Per quintal) for shipping steel from furnaces to rolling mills are shown in the following table:

	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>	M <sub>5</sub>	Supply
F <sub>1</sub>	4	2	3	2	6	8
F <sub>2</sub>	5	4	5	2	1	12
F <sub>3</sub>	6	5	4	7	7	14
Demand	4	4	6	8	8	

What is the optimum shipping schedule? (USE VAM Method)

- Q. 3 (b) ABC Company is engaged in manufacturing 5 brands of packed snacks. It has five manufacturing set ups, each capable of manufacturing any of its brands one at a time. The costs to make a brand on these setups vary according to the following table. 7

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>
B <sub>1</sub>	4	6	7	5	11
B <sub>2</sub>	7	3	6	9	5
B <sub>3</sub>	8	5	4	6	9
B <sub>4</sub>	9	12	7	11	10
B <sub>5</sub>	7	5	9	8	11

Assuming five setups are S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub> and S<sub>5</sub> and five brands are B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub> and B<sub>5</sub>. Find the optimum assignment of products on these setups resulting in minimum cost.

- Q. 4 (a) Explain various steps associated with Operation Research approach to problem solving. 7

- Q. 4 (b) Explain Infeasibility and Unboundedness with suitable example. 7

**OR**

- Q. 4 (a) In a city, only 2 brands of cola are sold: AA and BB. If a buyer bought cola AA last time, there is 0.75 chances that he would buy the same cola in the next purchase. Similarly, it is known that if a buyer bought brand BB last time, the probability for him to buy the brand AA next time is 0.4. 7

- Using this information, develop the transition probability matrix.
- Calculate the probability that a customer, who is currently a cola AA purchaser, shall take cola BB in the next – to – next purchase.

- Q. 4 (b) Explain various types of networks models with proper examples. 7

- Q. 5 A telephone exchange has 2 long distance operators. It is observed that, during the peak load, long distance calls arrive in a Poisson fashion at an average rate of 15 per hour. The length of service on these calls is approximately exponentially distributed with mean length of 5 minutes. 14

- What is the probability that a subscriber will have to wait for this long distance call during the peak hours of the day?
- If the subscribers will wait and are serviced in turn, what is the expected waiting time?

**OR**

Q. 5

A small retailer has studied the weekly receipts and payments over the past 200 weeks and has developed the following set of information: **14**

Weekly Receipts (Rs.)	Probability	Weekly Payment (Rs.)	Probability
3000	0.20	4000	0.30
5000	0.30	6000	0.40
7000	0.40	8000	0.20
12000	0.10	10000	0.10

Using the following sequence of random numbers, simulate the weekly pattern of receipts and payments for the 12 weeks of the next quarter, assuming further that the beginning bank balance is Rs 8000. What is the estimated balance at the end of the 12 weekly periods? What is the highest weekly balance during the quarter? What is the average weekly balance for the quarter?

Random numbers:

For receipts	For payments
3	61
91	96
38	30
55	32
17	3
46	88
32	48
43	28
69	88
72	18
24	71
22	99

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