

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

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

**MARWADI EDUCATION FOUNDATION**  
**FACULTY OF MANAGEMENT**  
**MBA – SEMESTER - 2**

**Subject Code: 2820007**

**Date: / / 2014**

**Subject Name: Quantitative Analysis - II**

**Time:**

**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)** Find the correct options. Each is carrying 1 mark.

**(06)**

1. When using a graphical solution procedure, the region bounded by the set of constraints is called the
  - a) Solution.
  - b) Feasible region
  - c) infeasible region
  - d) maximum profit region
2. If the number of filled cells in a transportation table does not equal the number of rows plus the number of columns minus 1, then the problem is said to be
  - a) Unbalanced
  - b) Degenerate
  - c) optimal
  - d) maximization problem
3. Which technique is used to connect all points of a network together while minimizing the distance between them?
  - a) Maximal Flow
  - b) Minimal Span
  - c) Shortest Route
  - d) Minimal Flow
4. Cars enter the drive-through of a fast-food restaurant to place an order, and then they proceed to pay for the food and pick up the order. This is an example of
  - a) Multichannel System
  - b) Multiphase System
  - c) Multiqueue System
  - d) none of these.
5. When simulating the Monte Carlo experiment, the average simulated demand over the long run should approximate the
  - a) Real Demand
  - b) Sample Demand
  - c) Expected Demand
  - d) Daily Demand
6. If the states in a system or process are such that the system can only be in one state at a time, then the states are
  - a) Collectively exhaustive
  - b) Mutually exclusive
  - c) Absorbing
  - d) Disappearing

**Q.1 (B)** Give the meaning of the following in short. Each is carrying 1 mark.

**(04)**

1. Absorbing State
2. Flood's Technique
3. Binding Constraint
4. Redundancy

**Q.1 (C)** Explain assumption of linear programming in brief.

**(04)**

**Q.2(A)** Explain Sensitivity analysis with suitable examples.

**(07)**

**Q.2(B)** Write dual of the following primal problem.

**(07)**

Minimize  $Z = 5X_1 + 7X_2 + 8X_3$

Subject to constraint

$X_1 - X_2 \leq 4$

$X_1 - 2X_2 + X_3 \geq 7$

$X_1 - 2X_2 + X_3 = 5$

$X_1, X_2, X_3 \geq 0$

**OR**

**Q.2(B)** The campaign manager for a politician who is running for reelection to a political office is planning the campaign. Four ways to advertise have been selected: TV ads, radio ads, billboards, and newspaper ads. The cost of these are \$900 for each TV ad, \$500 for each radio ad, \$600 for a billboard for one month, and \$180 for each newspaper ad. The audience reached by each type of advertising has been estimated to be 40,000 for each TV ad, 32,000 for each radio ad, 34,000 for each billboard, and 17,000 for each newspaper ad. The total monthly advertising budget is \$16,000. The following goals have been established and ranked:

**(07)**

- The number of people reached should be at least 1,500,000.
- The total monthly advertising budget should not be exceeded.
- Together, the number of ads on either TV or radio should be at least 6.
- No more than 10 ads of any one type of advertising should be used.

Formulate as a goal programming problem.

**Q.3(A)** Explain IBFS methods used in Transportation in detail.

**(07)**

**Q.3(B)** A company would like to determine the least expensive way of connecting houses it is building with cable TV. It has identified 11 possible branches or routes that could be used to connect the houses. The cost in hundreds of dollars and the branches are summarized in the table.

**(07)**

Find least expensive way to run cable to the houses.

| Branch    | Start node | End node | Cost (\$100s) |
|-----------|------------|----------|---------------|
| Branch 1  | 1          | 2        | 5             |
| Branch 2  | 1          | 3        | 6             |
| Branch 3  | 1          | 4        | 6             |
| Branch 4  | 1          | 5        | 5             |
| Branch 5  | 2          | 6        | 7             |
| Branch 6  | 3          | 7        | 5             |
| Branch 7  | 4          | 7        | 7             |
| Branch 8  | 5          | 8        | 4             |
| Branch 9  | 6          | 7        | 1             |
| Branch 10 | 7          | 9        | 6             |
| Branch 11 | 8          | 9        | 2             |

**OR**

**Q.3(A)** What are the assumptions of single server Queuing model?

**(07)**

**Q.3(B)** Mr. A is the proud owner of a 1955 sports car. On any given day, he never knows whether his car will start. Ninety percent of the time it will start if it started the previous morning, and 70% of the time it will not start if it did not start the previous morning.

**(07)**

(a) Construct the matrix of transition probabilities.

(b) What is the probability that it will start tomorrow if it started today?

(c) What is the probability that it will start tomorrow if it did not start today?

**Q.4(A)** What is Monte Carlo Simulation? Give application of Simulation in Business. (07)

**Q.4(B)** A university cafeteria line in the student center is a self-serve facility in which students select the food items they want and then form a single line to pay the cashier. Students arrive at a rate of about four per minute according to a Poisson distribution. The single cashier ringing up sales takes about 12 seconds per customer, following an exponential distribution. (07)

- (a) What is the probability that there are more than two students in the system?
- (b) What is the probability that the system is empty?
- (c) How long will the average student have to wait before reaching the cashier?
- (d) What is the expected number of students in the queue?
- (e) What is the average number in the system?

**OR**

**Q.4(A)** Give application of Markov analysis in Market share Calculation. (07)

**Q.4(B)** A service company wants to simulate the service call day received from a particular city. They compiled the data for last 120 days as given the following table. (07)

| No. of Service call | 0 | 1  | 2  | 3  | 4  | 5  | 6 | 7 |
|---------------------|---|----|----|----|----|----|---|---|
| Frequency           | 9 | 17 | 24 | 33 | 17 | 12 | 5 | 3 |

Simulate number of service call for a fortnight. Use following random numbers.

09, 87, 55, 25, 39, 67, 81, 98, 11, 43, 22, 64, 87, 54, 02, 32, 91, 69, 51, 78.

**Q.5(A)** MSA Computer Corporation manufactures two models of minicomputers, the Alpha 4 and the Beta 5. The firm employs five technicians, working 160 hours each per month, on its assembly line. Management insists that full employment (i.e., all 160 hours of time) be maintained for each worker during next month's operations. It requires 20 labor hours to assemble each Alpha 4 computer and 25 labor hours to assemble each Beta 5 model. MSA wants to see at least 10 Alpha 4s and at least 15 Beta 5s produced during the production period. Alpha 4s generate \$1,200 profit per unit, and Beta 5s yield \$1,800 each. (14)

1. Formulate as Linear Programming Problem.
2. Solve using Graphical Method.
3. Determine the most profitable number of each model of minicomputer to produce during the coming month.
4. How the solution will change if Profit on Alpha 4s reduces to \$900?
5. How the solution will change if technicians works 10 more hours per month?

**OR**

**Q.5(B)** Four automobiles have entered a Repair Shop for various types of work, ranging from a transmission overhaul to a brake job. The experience level of the mechanics is quite varied, and Bubba would like to minimize the time required to complete all of the jobs. He has estimated the time in minutes for each mechanic to complete each job. Billy can complete job 1 in 400 minutes, job 2 in 90 minutes, job 3 in 60 minutes, and job 4 in 120 minutes. Taylor will finish job 1 in 650 minutes, job 2 in 120 minutes, job 3 in 90 minutes, and job 4 in 180 minutes. Mark will finish job 1 in 480 minutes, job 2 in 120 minutes, job 3 in 80 minutes, and job 4 in 180 minutes. John will complete job 1 in 500 minutes, job 2 in 110 minutes, job 3 in 90 minutes, and job 4 in 150 minutes. Each mechanic should be assigned to just one of these jobs. (14)

1. What is the minimum total time required to finish the four jobs?
2. Who should be assigned to each job?