

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
MBA – SEMESTER 02– • EXAMINATION – SUMMER 2015

Sample Paper

Subject Code: 2820007

Date: // 2015

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) Answer the following multiple choice questions.

06

1. Which technique is used in finding a solution for optimizing a given objective, such as profit maximization or cost minimization under certain constraints?
 - A. Queuing Theory
 - B. Waiting Line Theory
 - C. Both A & B
 - D. Linear Programming
2. Every LPP is associated with another LPP is called -----
 - A. Primal
 - B. Dual
 - C. Non-Linear Programming
 - D. None of the above
3. A feasible solution is called a basic feasible solution if the number of non-negative allocations is equal to -----
 - A. $m-n+1$
 - B. $m-n-1$
 - C. $m+n-1$
 - D. None of the above
4. From the following which constraint is not a binding constraint if optimal solution is $x_1=18$ and $x_2=8$?
 - A. $2x_1 + 3x_2 = 60$
 - B. $4x_1 + 3x_2 = 96$
 - C. $6x_1 + 4x_2 = 150$
 - D. $5x_1 + 2x_2 = 106$

5. If Optimal Solution is $x_1=60$ and $x_2=40$ what would be the value of slack for constraint $2x_1 + 4x_2 = 400$?
 - A. 120
 - B. 150
 - C. 280
 - D. 180
6. In ----- models one set of properties is used to represent another set of properties.
 - A. Iconic
 - B. Analogue
 - C. Symbolic
 - D. Physical

Q.1 (b) Briefly explain the following terms.

04

1. Degeneracy in Transportation Problem
2. Redundancy in Linear Programming
3. Infeasibility
4. Slack and Surplus

Q.1 (c) What is Simulation? Describe Monte Carlo Simulation and its process.

04

Q-2 (a) Write the Dual of following:

07

Maximize $Z = 3X_1 + 4X_2 + 7X_3$

Subject to

$$X_1 + X_2 + X_3 \leq 10$$

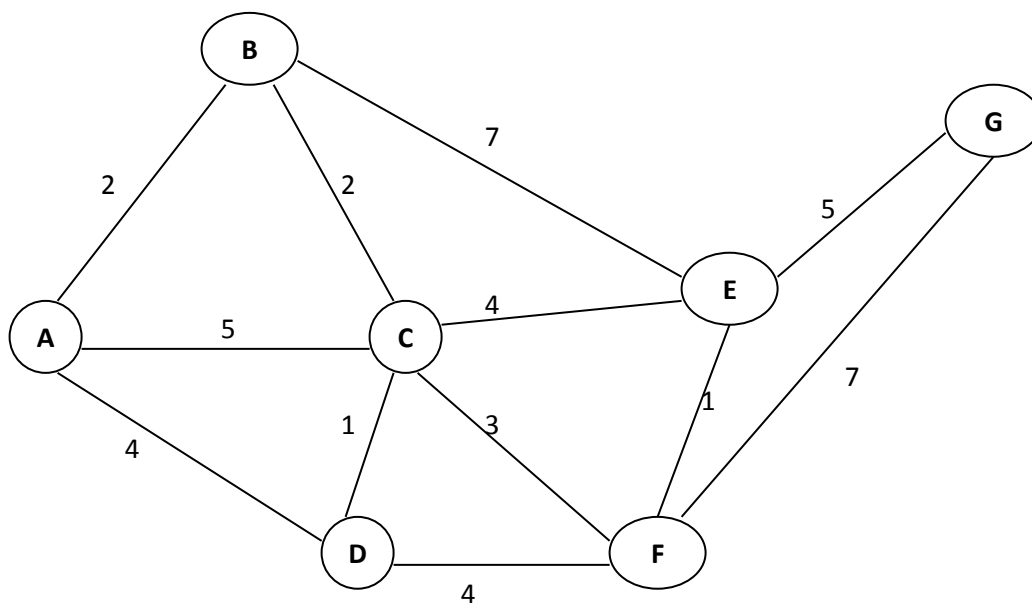
$$4X_1 - X_2 - X_3 \geq 15$$

$$X_1 + X_2 + X_3 = 7$$

$$X_1, X_2 \geq 0, X_3 \text{ Unrestricted}$$

Q-2 (b) Management of the Modern Corporation has decided to have a state-of-the-art fiber-optic network installed to provide high-speed communications between its major centers. The number next to each line gives the cost (in million dollars) if that particular cable is chosen for installation. The problem is to determine which cables should be installed to minimize the total cost of providing high-speed communications between every pair of centers.

07



OR

Q-2 (b) Solve the following traveling salesman problem so as to minimize the cost per cycle. **07**

From City	To City				
	1	2	3	4	5
1	-	10	25	25	10
2	1	-	10	15	2
3	8	9	-	20	10
4	14	10	24	-	15
5	10	8	25	27	-

Q-3 (a) Give and explain two applications each in management of Minimum-Spanning tree, Maximal Flow and Shortest Route models. **07**

Q-3 (b) Solve the following problem graphically, and determine the amounts of ingredients XA and XB that will go into each bag. Also indicate which are binding constraints and non binding constraints? **07**

MINIMIZE $Z = 4X_A + 5X_B$ (the cost in dollars of a 10 kg bag), subject to the constraints

i) $0.25X_A + 0.40X_B >$

$$\begin{aligned}
& 3; \\
& \text{ii) } 0.10X_A + 0.06X_B > 0.7; \\
& \text{iii) } 0.04X_A + 0.05 X_B < 0.5 \\
& \text{iv) } X_A + X_B < 10 \\
& \text{and } X_A, X_B \geq 0
\end{aligned}$$

OR

Q-3 (a) What is a Sensitivity analysis? Discuss the significance for managerial viewpoint. **07**

Q-3 (b) Roscoe Davis, chairman of a college's business department, has decided to apply a new method in assigning professors to courses next semester. Since each of the four professors taught each of the courses at one time or another during the two year period, Davis is able to record a course rating for each instructor. These ratings are shown in the table. Find the best assignment of professors to courses to **maximize** the overall teaching rating. **07**

PROFESSOR	COURSE			
	STATISTICS	MANAGEMENT	FINANCE	ECONOMICS
Anderson	90	65	95	40
Sweeney	70	60	80	75
Williams	85	40	80	60
McKinney	55	80	65	55

Q-4 (a) ABC Company produces two products, chandeliers and fans. Both these products require two process involving wiring and assembly. It takes about 2 hours to wire each chandeliers and 3 hours to wire a ceiling fan. Final assembly of chandeliers and fans requires 6 and 5 hours respectively. The production capability is such that only 12 hours of wiring time and 30 hours of assembly time are available. If each chandelier nets the firm Rs.700 and Rs. 600 respectively. Formulate the above as a goal programming problem with following goals: **07**

Priority 1: Produce at least 4 chandeliers and 3 fans.

Priority 2: Limit overtime in the assembly department to 10 hours and in the wiring department to 6 hours

Priority 3: maximize profit

Q-4 (b) In a project selection model, eight projects numbered 1, 2, ... 8 are in consideration. you require to write the constraints based on following conditions: **07**

a) Only one of the projects 3 & 8 has to be selected.

b) If only project 4 is selected then the project 7 can be selected, but if project 4 is selected then the project 7 may or may not be selected.

c) Not more than two of the projects 1, 3, 5, and 8 may be selected.

d) Identical decision is required in respect of projects 3 & 6.

e) Not more than 4 and not less than 2 of the projects 1, 2, 4, 5, 6, and 8 may be selected.

f) Exactly five of the projects are to be selected.

OR

Q-4 (a) Three business magazines, Business today, Business Line and Business Life, compete for advertising shares in a city. At the end of the last year, business today had 40% of the market while Others two each had 30% of the market. During the last year total revenue for the three magazines was Rs. 5 million and Business Today had a net profit of 15% of total revenue. Both the figures expected to remain same for the next year. The manager of Business Today has suggested a policy whereby it would retain 88% of its customers while gaining 12% and 8% of its customers from Business Line and Business Life respectively. Business Line is expected to retain 85% of its customers while gaining 7% and 10% from Business Today and Business Life respectively. Business Life would retain 82% of its customers while gaining 5% and 3% from Business Today and Business Line respectively. If the above policy would cost Rs. 50,000 do you think that it is advisable for Business Today to adopt it or it should follow an old policy? **07**

Q-4 (b) Explain Assumptions underlying Markov Analysis.

07

Q-5 A company has three plants and four warehouses. The supply and demand 07 in units and the corresponding transportation costs are given.

Plants	Warehouses				Supply
	I	II	III	IV	
1	5	10	4	5	10
2	6	8	7	2	25
3	4	2	5	7	20
Demand	25	10	15	5	

Answer the following questions, giving brief reasons:

1. Find the Initial Feasible Solution.
2. Is this solution degenerate?
3. Is this solution optimal? If no find the optimal Solution.
4. Does this problem have more than one optimal solution? If so, show all of them.

OR

Q-5 The Aircraft company operates a large number of computerized Plotting machines for creating pens. Currently, the Division replaces each pen as it fails. The service manager has, however proposed replacing all four pens every time one fails. This should cut down the frequency of plotter failures. At present, it takes one hour to replace one pen. All four pens could be replaced in 2 hours. The total cost of plotter being unusable is 50\$ per hour. Each pen costs 8\$. If only one pen is replaced each time a clog or jam occurs, the following breakdown data are thought to be valid:

Hours between plotter failures if one pen is replaced during a repair	Probability	Hours between plotter failures if all four pens are replaced during a repair	Probability
10	0.05	100	0.15
20	0.15	110	0.25
30	0.15	120	0.35

40	0.20	130	0.20
50	0.20	140	0.05
60	0.15		
70	0.10		

Based on the service manager's estimates, if all four pens are replaced each time one pen fails, the probability distribution between failures is as above:

Simulate the Division's problem and determine the best policy for a sample size of 10. Should the firm replace one pen or all four pens on a plotter each time a failure occurs?

Use following random numbers if one pen is replaced 47, 03, 11, 10, 67, 23, 89, 62, 56, 74

Use following random numbers if four pens are replaced 99, 29, 27, 75, 89, 78, 68, 64, 62, 30
