

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

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

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**MBA – SEMESTER 02– • EXAMINATION – WINTER 2015**

**Subject Code: 2820007**

**Date: 23/12/2015**

**Subject Name: Quantitative Analysis - II**

**Time: 02.30 PM TO 05.30 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** Identify the correct option and give the answer from the following questions. **6**

- 1 When using a graphical solution procedure the region bounded by the set of constraint is called the...  
A Solution C Infeasible region  
B Feasible region D Maximum profit
- 2 In the optimal solution to linear program, there are 20 units of slack for constraints. From this we interpret that..  
A The dual price for this constraint is 20 C The dual price for this constraint is zero  
B This constraints must be redundant D The problem must be maximization
- 3 If the total demand is greater than total supply in a transportation problem then,  
A The optimal solution will be degenerate C A dummy destination must be added  
B A dummy source must be added D Both dummy source and dummy destination must be added
- 4 Customers enters the waiting line at a cafeteria on first come first serve basis. The arrival rate follows a poison distribution and service time follows an exponential distribution. If the average number of arrivals is 6 per minute and average service rate of single server is 10 per minute, what is the value of utilizations parameter?  
A 0.6 C 1.67  
B 0.90 D 0.25
- 5 In the matrix of transition probabilities,  
A The sum of probability in each column equals to 1 C The sum of probability in each row equals to 1  
B There must be one zero in each row D There must be one zero in each column
- 6 Goal Programing  
A Requires only that you know whether goal is direct profit maximization or cost minimization C Is an algorithm with the goal of quicker solution to integer programming problem  
B Allows us to have multiple goals with priorities D None of the above

**Q.1 (b)** Explain the meaning of the following terms:

**04**

1. Constraints
2. Degeneracy
3. Balking (Queuing system)
4. Unbalanced assignment problem

**Q.1** (c) What is operation research? Explain the application of operation research in the current scenario in management. **04**

**Q.2** (a) Write the dual of the following linear programming problems: **07**

1.  $Z \max = 8X_1 + 10X_2 + 5X_3$

W.S.C.

$$X_1 - X_3 \leq 4$$

$$2X_1 + 4X_2 \leq 12$$

$$3X_1 + 2X_2 - X_3 \geq 7$$

$$X_1, X_2, X_3 \geq 0$$

2.  $Z \min = X_1 - 3X_2 - 2X_3$

W.S.C.

$$3X_1 - X_2 + 2X_3 \leq 7$$

$$2X_1 - 4X_2 \geq 12$$

$$-4X_1 + 3X_2 + 8X_3 = 10$$

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

(b) A salesman has to visit five cities A,B,C,D and E. The distance (In Hundred KM) between the five cities are as follows: **07**

	A	B	C	D	E
A	----	4	10	14	2
B	12	----	6	16	4
C	16	14	----	8	14
D	23	8	14	----	10
E	2	6	4	16	-----

If the salesman starts from city A and has to be come back to city A under the condition that traveling salesman should travel each city only once. Which route should he select so that the total distance travelled by him is minimized?

**OR**

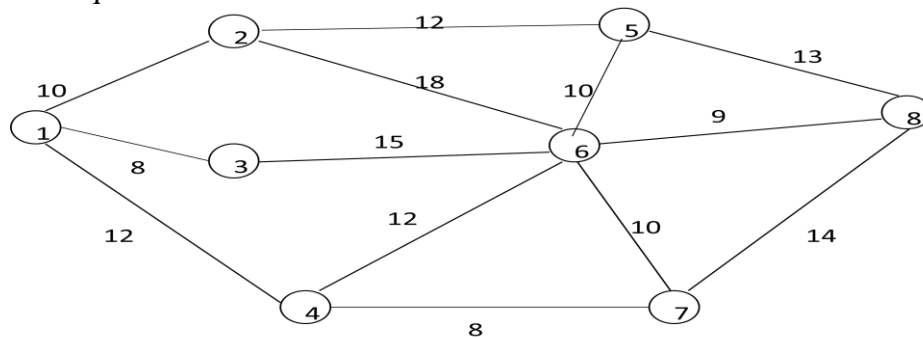
- (b) Mr Nanavati is a leading advocate of our country, he employs typists on hourly piece-rate basis for daily work. There are five typist and their charges and typing speed are different. As per the decision of Mr Nanavati, only one job was given to typist and the typist was paid for full hour, even if he worked for the fraction of an hour. Find the most suitable task for each typist and least allocation of the following data with Hungarian methods: 07

Typist	Rate per Hour	Number of pages typed per hour
A	15	12
B	16	14
C	10	09
D	12	10
E	14	11

Job/Task	Number of Pages
P	100
Q	88
R	75
S	150
T	90

- Q.3** (a) What is Integer programming? Explain the various types of integer programming in detail. 07

- (b) 07  
Roshni Goenka, a leading entrepreneur of Gujarat recently purchased a farm house and is planning to install water system connecting to various part of farms. The location of facilities and distance between them are given in the following diagram. Derive the least expensive way to provide water to each facilities by using the minimum spanning tree technique.



**OR**

- Q.3** (a) Write a short note on: 07  
i. Goal Programming  
ii. Sensitivity analysis

- (b) 07  
Customers for famous TGB bakery arrived randomly following poisson process. The single salesman can attend customers at an average rate of 10 customers per hour the service time being distributed exponentially. The mean arrival rate is 10 minutes per customers. Find the answers of the following questions:  
1. What is the probability of having four customers in a queue?  
2. What is the average time spent by customers in the TGB bakery?  
3. What is the expected number of customers waiting in a queue?

4. What is the probability that the waiting time of customer in queue shall be more than 15 minutes in bakery?  
( $e^{-1} = 0.368$ ,  $e^{-2} = 0.1353$ )

**Q.4 (a)** Write a short note on, **07**

1. Various types of queuing structure
2. Brand switching in Markov chain process

**(b)** Sales India, a leading consumer durables dealer stocks 1.5 tons Air conditions that it sells to home owners and installs for them at free of cost. The owner, Mr John, likes the idea of having large supply on hand to meet the customer demand. At the same time he understands that it is very expensive process. He examines the sale of ACs over past 100 weeks and notes the following: **07**

ACs sold per week	22	23	24	25	26	27	28	29	30
Number of weeks	2	9	10	15	25	14	12	8	5

1. If Sales India maintains a constant supply of 26 AC in any given week, how many times will they be out of the stock during 10 weeks simulations? You can use the following random numbers for the calculations: (10,24,03,32,23,59,95,34,35,51)
2. What is the average number of sales per week (including the stock outs) over the 10 weeks period?
3. Using an analytical non simulation technique, what is the expected number of sales per week? How does this compare with the simulation technique?

**OR**

**Q.4 (a)** What is Simulations? Explain the Monte Carlo method of simulation. Also state the merits and the demerits of the same. **07**

**(b)** In Gujarat, oral care market is very competitive and mainly two major group dominate the market: Colgate and Pepsodent. It is given that a customer last purchased brand Colgate 70 percent of chance that he would buy the same brand in next purchase. While if a customer purchases brand Pepsodent, there are 60 percent of chances that his next purchase would be the same brand. Using this information develop the transition probability matrix and answer the following questions: **07**

1. Find the probability that customer currently is a brand Colgate purchaser, he will purchase brand Pepsodent two purchases from now.
2. Find the probability that a customer brand Pepsodent purchaser, he will purchase brand Colgate three periods from now.
3. Also find steady state probability market share of two brands and interpret the results.

**Q.5** Recently Ford Limited launched new plant in Gujarat near Ahmedabad. In the new plant of company, they produce two types of cars: Ford Figo and Ford Fiesta. The production manager of the plant shares the **14**

following information regarding the worker/technocrat, assembly time and finishing time for Figo and Fiesta.

	Worker/technocrat	Assembly time	Finishing time
Figo	12	3	8
Fiesta	12	6	4

In this plant of Ford, currently 840 Worker/technocrat provide the service and not more than 300 hours of assembly time and 480 hours of the finishing time available. CEO of Ford Ltd is confident about profit of new Figo 50,000 Rs and Fiesta 70,000 Rs. On the basis of the given information formulate the LPP and solve by graphical methods. Give the answer of the following questions with suitable quantitative tools:

1. Derive the binding and non binding constraints of the problems and interpret each of them.
2. How much would the cost increase if 1000 workers are rendered by the company instead of 840? And with the special effort assembly time were increased from 300 hours to 400 hours, what will be the implications?
3. The production manager of Ford Ltd want to start a manufacturing Ecosport car in the same plant, to manufacture this car require 15 workers, 8 hours of assembly time and 10 hours of finishing time. Ecosport generates the profit of 85,000 Rs. Being the consultant of the company give your valuable advice to the production manager with suitable justification, whether the company should start manufacturing Ecosports car in the same plant or not?
- 4.

**OR**

**Q.5**

ABG shipping corp. is a leading shipping corporation of the nation. They have offices in Mumbai and Gandhidham. They provide services to different company and transport their goods to warehouses to marketplaces. The following table provides all necessary information on the availability of supply of each warehouse to the requirement of the various markets. And the unit transportation cost in thousand Rs from each warehouse to each market is mentioned below.

**14**

	Markets				
Warehouse	P	Q	R	S	Supply
A	6	3	5	4	22
B	5	9	2	7	15
C	5	7	8	6	8
Demand	7	12	17	9	45

Mr Sanjay, the shipping clerk of ABG shipping agency usually prepares schedule of transportation based on his expertise and vast experience. Mr Sanjay has worked out the following schedule on the basis of assumptions.

1. 12 units from A to Q

2. 1 unit from A to R
3. 9 units from A to S
4. 15 units from B to R
5. 7 units from C to P
6. 1 unit from C to R

1. Being a consultant of the company, check and analyze whether Mr Sanjay has arranged optimal schedule or not? You can apply transportation method.
  2. Find the optimal schedule and minimum total transportation cost whether this problem has only one optimal solution or not? Justify your answer.
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