

GUJARAT TECHNOLOGICAL UNIVERSITY**M.B.A -IInd SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 2820007****Date: 04/06/2012****Subject Name: Quantitative Analysis - II****Time: 10:30 am – 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) What do you understand by infeasibility and unboundedness in LPP? 04

(b) A rubber company is engaged in producing three different types of tyres 10
 A, B, and C. The company has two production plants to produce these. In a normal eight hour working day, plant I produces 100, 200 and 200 tyres of type A, B and C respectively. Plant II produces 120, 120 and 400 tyres of type A, B, and C respectively. The monthly demand of A, B and C is 5000, 6000, and 14000 units respectively. The daily cost of operation of plants I and II are Rs. 5000 and Rs. 7000 respectively. Find the minimum number of days of operation per month at two different plants to minimize the total cost while meeting the demand using graphical method.

Q.2 (a) Why sensitivity analysis is known as post optimality analysis? Also 04
 discuss the importance of sensitivity analysis in LPP.

(b) Develop the dual of the following LPP: 10
 Maximize $Z = 8X_1 + 10X_2 + 5X_3$
 Subject to

$$X_1 - X_3 \leq 4$$

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

$$X_1 + X_2 + X_3 \geq 2$$

$$3X_1 + 2X_2 - X_3 = 8$$

Where $X_1, X_2, X_3 \geq 0$

OR

(b) Briefly discuss the history of Operations Research. Also discuss the 10
 nature and characteristics of OR.

Q.3 (a) An electric company produces only two products lamp and ceiling fan. 07

It takes about 2 hours to wire each lamp and 3 hours to wire a ceiling fan. Final assembly of lamp and fan requires 6 and 5 hours respectively. The production capacity is such that only 12 hours of wiring time and 30 hours of assembly time are available. Each lamp produces net profit of Rs. 7 and each fan Rs.6. the company wants to achieve following four equally important goals:

Goal 1: To produce profit of Rs.30 during the production period

Goal 2: To fully utilize the available wiring department hours

Goal 3: To avoid overtime in assembly department

Goal 4: To produce at least 7 fans during the production period

Formulate this as Goal Programming Problem.

- (b) What are the differences among Linear programming problem, Integer programming problem and Goal programming problem. What are the different types of integer programming problem? **07**

OR

- Q.3** (a) A company has four factories F1, F2, F3, and F4 manufacturing the same product. Production and raw material costs differ from factory to factory and are given in the following table. The transportation costs from the factories to sales depots S1, S2, S3 are also given in the table. The sales prices and the total demand at each depot and the production supply of each factory are as represented in the table. **12**

	F1	F2	F3	F4	Sales Price/unit	Demand
Production cost/unit	15	18	14	13		
Raw material cost/unit	10	9	12	9		
S1	3	9	5	4	34	80
S2	1	7	4	5	32	120
S3	5	8	3	6	31	150
Supply	10	150	50	100		

Determine the most profitable production and distribution schedule and corresponding profit. The surplus production should be taken to yield zero profit.

- (b) Discuss the problem of degeneracy in transportation problem. **02**

- Q.4** (a) In the modification of a plant layout of a factory four new machines M1, M2, M3, and M4 are to be installed in the machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine M2 cannot be placed at C and M3 cannot be placed at A. The cost of locating a machine at a place in hundreds of rupees is as under: **07**

	A	B	C	D	E
M1	9	11	15	10	11
M2	12	9	--	10	9
M3	--	11	14	11	7
M4	14	8	12	7	8

Find the optimal assignment schedule.

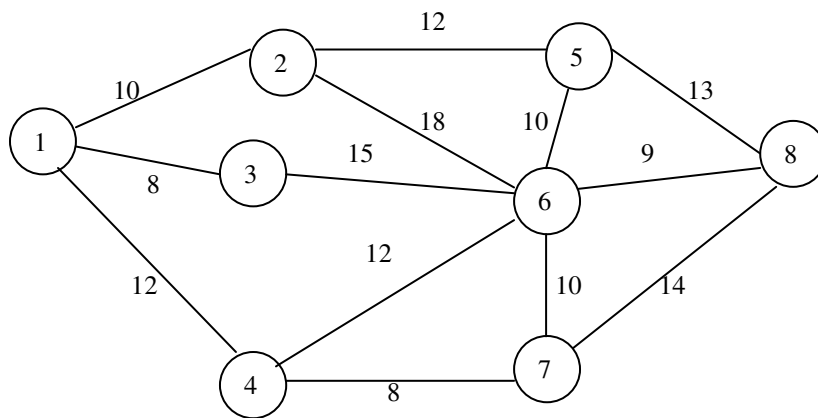
- (b) Why is it important to study queuing system in Management discipline? Discuss various types of queuing systems in brief. **07**

OR

- Q.4** (a) Discuss the concept of Brand Switching with an example. What is steady state condition in Markov Analysis? **07**

- Q.4** (b) What do you understand by cost coefficients, and technological coefficients in LPP? In which situation 100 % rule is applicable in multiple parameter changes in cost coefficients? Briefly discuss the rule. **07**

- Q.5 (a)** A horse breeding farm is planning to install a complete water system connecting all of the various stables and barns. The location of facilities and the distances between them are given in the following diagram. Identify the least expensive way to provide water at each facility using minimum spanning tree technique. **07**



- (b)** A Doctor is working in a small village. The number of patients approaching the dispensary appears to be Poisson distributed with a mean of six patients per hour. The Doctor attends the patients on a first come first served basis and the patients wait if the need be. The Doctor can attend the patients at an average rate of 10 patients per hour with a service time exponentially distributed. Answer the following questions: **07**
- Calculate the utilization Parameter
 - Find the probability that the queuing system is idle.
 - Find the average time that the doctor is free on an 8 hour working day
 - What is the average length of queue that has at least one patient?
 - What is the expected time a patient would spend in the dispensary?

OR

- Q.5 (a)** In the Saurashtra, only two brands of nail polish, A and B, are sold. **07**
 Given that a lady last purchased brand A, there is 80% chance that she would buy the same brand in the next purchase, while if a lady purchased brand B, there is 90% chance that her next purchase would be brand B. Using these information develop the transition probability matrix. Calculate
- The Probability that if a lady is currently a brand A purchaser, she will purchase brand B two purchases from now.
 - The probability that if a lady is a brand B purchaser, she will purchase brand A three periods from now.
 - The probability that three periods from now, a lady shall buy brand B, given that the market share of the two brands is as follows: Brand A 70% and Brand B 30%.

- (b) A company manufactures around 150 motorcycles. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions. The production probabilities are as under : **07**

Production per day	Probability
146	0.04
147	0.09
148	0.12
149	0.14
150	0.11
151	0.10
152	0.20
153	0.12
154	0.08

The finished motorcycles are transported in a specially arranged lorry accommodating only 150 motorcycles. Using the random numbers 80,81,76,75,64,43,18,26,10,12, simulate the process to find out:

- What will be the average number of motorcycles waiting in the factory?
- What will be the average number of empty spaces on the lorry?
