Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER 2013

Subject Code: 152005 **Date: 09-12-2013**

Subject Name: Quantitative Techniques in Management

Time: 10.30 am - 01.00 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 Chemical company manufactures two chemicals A and B which are sold to the manufacturers of soap and detergents. On basis of the next month's demand, the management has decided that the total production for chemicals A and B should be at least 350 kilograms. Moreover, a major customer's order for 125 kg of product A must also be supplied. Product A requires 2 hours of processing time per kilogram and product B requires one hour of processing time per kilogram. For the coming month, 600 hours of processing time are available. **14**

The company wants to meet the above requirements at minimum total production cost. The production costs are Rs 2 per kilogram for product A and Rs 3 per kilogram for product B.

A company wants to determine its optimal product mix and the total minimum cost relevant thereto.

1) Formulate the above as a linear programming problem.
2) Solve the problem with simplex method.
3) Does the problem have multiple optimal solutions? Why?

Q:2 (a)

1. What do you understand by unbalanced transportation problem? How would you convert it into balanced transportation problem? **04**
2. What is the indication that a given transportation problem has multiple optimal solutions? **03**

(b) Explain and illustrate the following principles of decision making: **07**

1. Laplace 2. Maximin 3. Maximax 4. Hurwicz

OR

(b) Give the various sequencing models that are available for solving sequencing problems. Give suitable examples. **07**

Q:3 A project consists of 10 activities, each of which requires either or both of two types of resources R_1 and R_2 for its performance. The duration of the activities and their resource requirements are: **14**

Resource availability : R_1 : 7 units, R_2 : 5 units

Determine the duration of the project under the given resource constraint. If the resource would not a problem, how long would the project take to complete in the normal course?

Activity	Duration (days)	Resource requirement	
		R_1	R_2
1-2	3	3	2
1-3	2	6	-
1-4	6	4	-
2-6	4	-	4
3-5	2	2	2
4-5	1	4	-
4-8	4	4	-
5-7	3	3	2
6-7	2	1	3
7-8	4	4	5

OR

Q:3 A businessman has two independent investments A and B available to him but he lacks the capital to undertake both of them simultaneously. He can choose to take A first and then stop or if A is successful then take B or vice versa. The probability of success on A is 0.7, while for B it is 0.4. Both investments require an initial capital outlay of Rs. 2,000, and both return nothing if the venture is unsuccessful. Successful completion of A will return Rs. 3,000 (over cost), successful completion of B will return Rs. 5,000 (over cost). Draw the decision tree and determine the best strategy. Also solve the problem by pay-off table. **14**

Q:4 (a) The cost of new machine is Rs. 5,000. The maintenance cost during the nth year is given by Mn = Rs. 500(n-1), where n = 1,2,3,….If the discount rate per year is 0.05, after how many years will it be economical to replace the machine by new one? **07**

(b) How will you handle the following situations in assignment problem? Explain with suitable example:

1. Maximization **04**
2. Unbalanced problem **03**

OR

Q:4 (a) Find the cost per period of individual replacement policy of an installation of 300 light bulbs, given the following: **07**

1. Cost of replacing an individual bulb is Rs. 2.
2. Conditional probability of the failure is given below:

Week no.	0	1	2	3	4
Conditional probability of failure	0	0.1	0.3	0.7	1.0

Also calculate the number of light bulbs that would fail during each of the four weeks.

(b) Give a general structure of queuing system and explain. Illustrate some queuing situations. **07**

Q:5 (a) Using the graphical method, determine the optimal sequence needed a process jobs 1 and 2 on five machines, A, B, C, D and E. For each machine find the job which should be done first. Also calculate the total time needed to complete both the jobs. **07**

Job 1	Sequence	A	B	C	D	E
	Time (hrs)	1	2	3	5	1
Job 2	Sequence	C	A	D	E	B
	Time (hrs)	3	4	2	1	5

(b) A project schedule has the following characteristics: **07**

Activity	Time (weeks)	Activity	Time(week)
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

Construct the network diagram and find the critical path.

OR

Q:5 **(a)** Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees. **07**

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	

(b) Solve the following assignment problem **07**

	1	2	3	4	5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	13

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