Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject Code: 152005 **Date: 15/05/2015**

Subject Name: Quantitative Techniques in Management

Time: 02.30pm-05.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q:1 An animal feed manufacturing company manufactures two types of feed, Feed Activex and Feed Solutex. Each of the feed must contain some of four ingredient prescribed by veterinary doctor. These ingredients are a, b, c and d. the daily per head requirement (in kilograms) of the feed and the ingradients in each of the product is as given in following table. Determine the quantity of the feeds in the mixture so that the total cost is minimum. For solution of this LP problem use the dual form of it. **14**

Ingredient	Feed Activex	Feed Solutex	Requirement
a	1	0	4
b	0	1	6
c	1	2	2
d	2	1	18
Cost	7	5	

Q:2 (a)

1. Explain the differences and similarities between Assignment problem and Transportation problem. **04**
2. Explain why VAM or any other methods of getting basic feasible solution to a transportation problem is not used to get a solution to assignment problem. What difficulties you come across? **03**

(b) A multinational company has installed a beverages vending machine in its premises. This imported machine requires costly spare parts during repairs and maintenance. The spare parts cost Rs. 4000 each but are available only when the machine is ordered. In case the vending machine has a breakdown and spares are not available, it will cost atleast Rs. 20,000 for repairs, including downtime, and for alternate arrangements. The vending machine has an estimated life of five years and the probability distribution of failures every year over five year is given in the following table. **07**

Number of failure per year	Probability of failure
0	0.1
1	0.2
2	0.3
3	0.25
4	0.1
5	0.05

Determine the following:

(a) Decision on basis of the EMV method

(b) The regret table and the optimum choice on the basis of the lowest expected regret criterion

(c) The EVPI

OR

(b) How will you deal with replacement of items that fail completely and suddenly? **07**

Q:3 **(a)** The number of customers approaching the tailor appear to be Poisson distributed with mean of 6 customers per hour. The tailor attends the customers on first come first served basis and the customer wait if the needed be. The tailor can attend the customers at an average rate of 10 customers per hour with the service time exponentially distributed. **07**

I. Find the utilisation parameter.

II. What is the expected number of customers in the tailor shop?

III. What is the expected number of customers waiting for tailor's service?

IV. What is the average length of queues that have at least one customer?

V. How much time should a customer expect to spend in the queue?

VI. What is the expected time a customer would spend in the tailor shop?

(b) A machine operator has to perform three operations, namely plane turning, step turning and taper turning on a number of different jobs. The time required to perform these operations in minutes for each operating for each job is given in the matrix given below. Find the optimal sequence, which minimizes the time required. **07**

Job	Time for plane turning In minutes	Time for step turning in minutes	Time for taper turning in minutes
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

OR

Q:3 **(a)** The city post office has five major counters namely, Registration (R), Savings (S), Money –Order (M), Postal stationary (P) and Insurance / license (I). The postmaster has to assign five counters to five clerks A, B, C, D and E one for each counter. Considering the experience and ability of these clerks he rates their suitability on a certain 10 - point scale of effectiveness of performance for accomplishing different counter duties, as listed below. Assign the counters to the clerks for maximum effective performance. **07**

Clerks (effective performance)

	A	B	C	D	E
R	6	6	4	6	7
S	5	4	3	6	8
M	7	6	3	5	5
P	7	5	6	8	8
I	4	3	6	7	6

(b) A manufacturing company processes 6 different jobs on two machines A and B in the order AB. Number of units of each job and its processing times in minutes on A and B are given below. Find the optimal sequence and total elapsed time and idle time for each machine. **07**

Job	Number of units of each job	Machine A: Time in minutes	Machine B: Time in minutes
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

Q:4 **(a)** Explain and illustrate the following principles of decision making: **07**

1. Laplace 2. Maximin 3. Hurwics 4. Savage

(b) What are the essential characteristics of operation research? Mention different phases in an operations research study. Point out some limitations of operation research. **07**

OR

Q:4 **(a)**

1. What are the characteristic features of a closed loop? **07**
2. What is degeneracy ? How does the problem of degeneracy arise in transportation problem? How can we deal with this problem?

(b) The cost of new scooter is Rs 10,000. Compare the optimum moment of replacement assuming the following cost information. **07**

Age of scooter (years)	Repair cost per year (Rs.)	Salvage value at the end of year(Rs.)
1	5000	8000
2	10000	6400
3	10000	5120

Assume that the repairs are made at the end of each year only if the scooter is to be retained and are not necessary if the scooter is to be sold for the salvage value. Also assume that the rate of discount is 10%.

Q:5 The list of activities for erecting a canteen in a factory is given in the following table along with other relevant details. Job A must precede all others while job E must follow others. Apart from this, the jobs can run concurrently. The indirect cost is Rs. 300 per day. Find the minimum possible duration of project and the associated cost. **14**

Activity	Predecessor	Normal cost (Rs.)	Crash Cost (Rs.)	Normal duration (days)	Crash duration (days)
A	-	3000	4000	5	4
B	A	1200	2000	6	2
C	A	1000	1800	4	3
D	A	1200	2000	5	3
E	B,C,D	1600	1600	3	3

OR

Q:5 Consider the following transportation problem : **14**

	P	Q	R	S	supply
A	6	11	9	8	200
B	13	10	8	15	300
C	9	9	14	12	500
D	12	10	12	10	100
Demand	300	250	300	200	

a) Find optimal solution to this problem and determine the total cost of transportation.
b) Is the optimal solution unique? If there is an alternative solution, identify it.
c) If the transporter agrees to reduce the transportation charges on route B-S by 40%, how will it affect the optimal solution?
d) It is decided to send 150 units on route A-P. How will the optimal solution and total cost be affected?
e) Trace the effect of sending 100 units on route C-S.

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