MBABM/MBAITM

Term-End Examination

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June, 2015

MBM-013 : QUANTITATIVE TECHNIQUES

Time : 3 hours   *Maximum Marks : 100*

Note :

(i)   *Section I is **compulsory**.*

(ii)   *In Section II, solve any **five** questions.*

(iii) *Assume suitable data wherever required.*

(iv)   *Draw suitable sketches wherever required.*

(v)   *Italicized figures to the right indicate maximum marks.*

SECTION I

1. Green Star Pvt. Ltd. has a farm of 100 acres and they have cultivated various crops. The farm produces and sells tomatoes, lettuce and radish. The price they can obtain is ₹ 10 per kg for tomatoes, ₹ 8 per head of lettuce and ₹ 9 per kg of radish. Average yield per acre is 200 kg of tomatoes, 3000 heads of lettuce and 1000 kg of radishes. Fertilizers are available at ₹ 5 per kg per acre and requires 100 kg for tomatoes and

lettuce and 50 kg for radish. Labour required for sowing, cultivating and harvesting per acre is 5 man-days for tomatoes and radish and 6 man-day for lettuce. A total of 400 man-days labour is available at ₹ 500 per man-day. Formulate the above problem as a Linear Programming Problem. *10*

2. (a) Can an Assignment problem be solved using a Linear Programming Problem (LPP) approach ? Justify your answer with example. *5*

   (b) In decision-making, a company uses two measures — EPPI and EVPI. Discuss the relevance of the above two measures by giving suitable examples. *5*

   (c) Generally a Transportation Model is used for deciding the optimal allocations from Sources to Destination in the transportation of goods. What besides this will be the applicability of the Model ? (You have to describe two examples) *5*

   (d) A Simulation approach is used for solving Queuing problems. How will you determine (i) Queue length and (ii) Average waiting time by Simulation method ? *5*

SECTION II

3. Maximize z = 12a + 4b + 4c,
   subject to the constraints

   $$a + 4b + 2c \leq 100$$

   $$2a + b + 2c \leq 80$$

   $$a + 3b + 2c \leq 80$$

   $$a, b, c \geq 0$$

   Use Simplex method to solve the above problem.   *14*

4. A firm has three consultants, each consultant can work up to 180 hours during the next month. During this time, three projects must be completed. Three Projects need 130 hours, 140 hours and 160 hours respectively for completion. The amount (in ₹) per hour that can be billed to the customer is as follows :

Project	1	2	3
Consultant 1	₹ 1,200	₹ 1,500	₹ 1,900
Consultant 2	₹ 1,400	₹ 1,300	₹ 1,200
Consultant 3	₹ 1,600	₹ 1,400	₹ 1,500

   Formulate this as a Transportation problem and allocate the number of hours with respect to the project for each consultant. (State the assumptions made)   *10*

   Also find the maximum optimal total billings during the next month.   *4*

5. Assign the following jobs to different machines so that the total cost of operation is minimum. The costs are given in the respective cells. *14*

		Machines			
		1	**2**	**3**	**4**
Jobs	*1*	5	3	1	8
	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	6

6. (a) A bakery keeps a stock of a popular brand of cakes. Previous experience shows the daily demand pattern for the item with associated probabilities as given :

Daily Demand (Nos.)	0	10	20	30	40	50
Probability	0·10	0·20	0·15	0·50	0·03	0·02

Use the following sequence of random numbers :

Random Numbers	25	39	65	76	12	05	73	89	19	49

Simulate the demand for next 10 days. *6*

Also find out the average demand per day. *4*

(b) A tailor in Pune is very famous. The number of customers who approach the tailor appear to be Poisson distributed with a mean of 8 customers per hour. The tailor attends the customers at an average rate of 10 customers per hour. Find the probability of idle time for the tailor. *4*

7. A physician purchases a particular vaccine at a cost of ₹ 10 per dose and he charges ₹ 50 per dose from patients. Unused vaccine at the end of the week is destroyed. Suggest an optimal number of doses he should buy per week and also find EPPI. Following table gives probability distribution of the demand : $\qquad$ 7+7

Doses per week	20	25	40	60
Probability	0·1	0·3	0·5	0·1

8. A company processes 5 jobs – p, q, r, s and t which can be processed in the machines A, B and C. The processing time in minutes is given below. What should be the sequence of the jobs to have minimum idle time ? Also calculate total elapsed time. $\qquad$ 10+4

Jobs	p	q	r	s	t
A	4	4	8	6	7
B	2	1	4	2	5
C	1	5	8	2	4