Total No. of Questions : 12]

SEAT No. :

P2670

[Total No. of Pages : 5

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B.E. (Mechanical Engg.)

QUANTITATIVE AND DECISION MAKING TECHNIQUES

(2008 Pattern) (Semester - I) (Elective - II) (402045C) (Theory)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***All the questions are compulsory.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of calculator is permitted.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Define terms of Linear Programming: Basic Solution, Feasible Solution and Artificial Variables. **[6]**

b) Two products P_1 and P_2 are to be manufactured by a firm. Profits on P_1 and P_2 are Rs.30 and 20 respectively. The products are to be processed on two machines, i.e., first on milling machine and other on surface grinder. The capacities and the time required to produce a unit are as follows: **[12]**

	P_1	P_1	Capacity
Milling machine	3 hours	1 hour	1500man hours/month
Surface machine	1hour	1hour	1000man hours/month

OR

Q2) a) What is optimization? Explain various applications of linear programming. **[6]**

b) Solve LPP by Suitable Method **[12]**

Maximize:

$$Z=100X_1 + 60X_2 + 40X_3$$

Subject to:

$X_1 + X_2 + X_3 \leq 100$

$10X_1 + 4X_2 + 5X_3 \leq 600$

$2X_1 + 2X_2 + 6X_3 \leq 300$

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

P.T.O.

Q3) a) Explain with a suitable example 'Degeneracy in Transportation Problem'. **[6]**

b) Solve the following Transportation problem involving three sources and three destinations. The cell entries represent the cost of transportation per unit. Obtain the initial solution by VAM method and find optimal solution by MODI method. **[10]**

		Destinations			
		1	2	3	Supply
Sources	1	1	4	8	10
	2	7	2	3	20
	3	5	4	2	15
	Demand	23	12	10	

OR

Q4) a) What is unbalanced assignment problem? How is it solved by the Hungarian Method? **[6]**

b) A company is faced with the problem of assigning six Machines to five different Jobs. The costs estimated in hundreds of rupees are given in the table below. Solve the problem assuming that the objective is to minimize the total cost. **[10]**

		Jobs				
		1	2	3	4	5
Machines	1	2.5	5	1	6	2
	2	2	5	1.5	7	3
	3	3	6.5	2	8	3
	4	3.5	7	2	9	4.5
	5	4	7	3	9	6
	6	6	9	5	10	6

Q5) a) Explain payback period method. **[6]**

b) We have five jobs, each of which must go through A, B and C. Processing times (in hours) are given in the following table: **[10]**

Machines	JOBS						
	1	2	3	4	5	6	7
A	3	8	7	4	9	8	7
B	4	3	2	5	1	4	3
C	6	7	5	11	5	6	12

Determine the optimal sequence of jobs that minimizes the total elapsed time. Also find the idle time for machines A, B and C.

OR

Q6) a) What is dynamic programming? Explain detailed procedures to solve problems of dynamic programming. **[6]**

b) The annual demand of parts is 3200. The unit cost is Rs.6 and inventory carrying charges are estimated as 25% per annum. If the cost per procurement is Rs.150 find: **[10]**

i) Economic order quantity

ii) Time between two consecutive orders.

iii) Number of orders per year.

iv) The optimum cost.

SECTION - II

Q7) a) What are the situations which make replacement of items necessary?**[6]**

b) A company has option of buying one of two computers: ABC and XYZ. ABC costs Rs. 5 lakh and its running and maintenance costs are Rs.60,000 for each of first five years, increasing by Rs.20,000 in sixth and every subsequent year. XYZ has the same capacity as that of ABC but costs only 2.5 Lakh. However its maintenance and running costs are 1,20,000 for first five years and increases by Rs. 20,000 per year thereafter. If the money is worth 10 percent per year, which computer should be purchased? What are the optimal replacement periods for each computer? Assume that there is no salvage value for either of computers. **[12]**

OR

Q8) a) Explain how the theory of replacement is used in the following situations

i) Replacement of items whose maintenance cost varies with time.

ii) Replacement of item that completely fail. **[6]**

b) Obtain the optimal strategies for both persons and the value of game for two person zero sum game whose pay off matrix is as follows (Use graphical Method) **[12]**

Player B

Player A	B1	B2
A1	1	–3
A2	3	5
A3	–1	6
A4	4	1
A5	2	2
A6	–5	0

Q9) a) What is the need of simulation? How can you use simulation to solve industrial problems? Discuss with example. **[6]**

b) A road transport company has one reservation clerk on duty at a time. He handles the information of bus schedules and makes reservations. Customers arrive at the rate of 8 per hour and the clerk can arrange, service 12 customers per hour. After stating your assumptions answer the following.

i) What is the average number of customers waiting for the service?

ii) What is the average time a customer has to wait before being served? The manager is contemplating to install a computer system for handling information and reservations. This is expected to reduce the service time from 5 minutes to 3 minutes. The additional cost of having new system is Rs.50 /day. If the cost of goodwill of having to wait is estimated to be 12 paisa per minute spent waiting, before being served, should company install the computer system. Assume an 8 hour working day. **[10]**

OR

Q10)a) What is the need of simulation? How can you use simulation to solve industrial problems? Discuss with example. **[6]**

b) A warehouse has only one loading dock manned by three person crew. Trucks arrive at the loading doc at average rate of 4 trucks per hour and the arrival rate is Poisson distributed. The loading of the trucks takes 10 minute in average and can be assumed to be exponentially distributed. The operating cost of the truck is Rs.20 per hour and the members of the loading crew are paid Rs 6 each per hour. What you advise the truck owner to add another crew of three persons? **[10]**

Q11)a) Explain the rules devised by Fulkerson. **[6]**

b) Estimated time for the jobs of a project are given below **[10]**

Job	A	B	C	D	E	F	G	H	I	J	K	L
Time (Weeks)	13	5	8	10	9	7	7	12	8	9	4	17

The constraints governing the job are
A & B are start jobs; A controls C, D & E; B controls F & J; G depends on C; H depends on D; E & F controls I &K; K follows J; L is also controlled by K; G,H,I & L are the last jobs. Draw the network, determine float for each activity, project duration and the critical path.

OR

Q12)Consider the project having following activities and their time estimates:

Job	A	B	C	D	E	F	G	H	I	J	K	L	M
Optimistic Time	3	4	5	9	4	3	5	1	2	7	4	8	6
Most likely Time	4	8	6	15	6	4	6	3	4	8	5	9	7
Pessimistic Time	5	10	8	10	8	5	8	4	5	10	6	13	8
Immediate Predecessors	--	--	B	A, C	B	D, E	D, E	D, E	G	F,I	G	H	J, K,L

a) Draw the network for the project

b) Compute the expected project completion time

c) What should be the due date to have 0.9 probability of completion. Find the E & L values for all events.

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