Seat No.: Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2172004/2172011 **Date:27/05/2019**

Subject Name:Production Optimization Techniques

Time:02:30 PM TO 05:00 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)** Explain and illustrate the following principles of decision making: **03**
(a) Laplace (b) Maximin (c) Maxima

(b) Answer the following questions: **04**

1. The key column indicates
   (a) Outgoing variable (b) Incoming variable,
   (c) Independent variable (d) Dependent variable
2. The total number of allocation in a basic feasible solution of transportation problem of $m \times n$ size is equal to
   (a) $m \times n$ (b) $(m / n) - 1$
   (c) $m + n + 1$ (d) $m + n - 1$
3. When money value changes with time at 10 %, then Present Worth Factor (PWF) for first year is :
   (a) 1 (b) 0.909
   (c) 0.852 (d) 0.9
4. At EOQ
   (a) Annual purchase cost = Annual ordering cost (b) Annual ordering cost = Annual carrying cost
   (c) Annual carrying cost = Annual shortage cost (d) Annual shortage cost = Annual purchase cost

(c) Solve LPP using simplex method. **07**

$$\text{Minimize } Z = 8x + 10y$$
$$\text{Subject to: } 3x + 9y \geq 100$$
$$8x + 4y \geq 150$$
$$x, y \geq 0$$

Q.2 **(a)** Explain the following terms related to queuing theory. **03**
1. Queue length 2. System length 3. Waiting time in queue

(b) A company manufactures two products *X* and *Y* whose profit contributions are Rs.10 and Rs. 20 respectively. Product *X* requires 5 hours on machine I, 3 hours on machine II and 2 hours on machine III. The requirement of product *Y* is 3 hours on machine I, 6 hours on machine II and 5 hours on machine III. The available capacities for the planning period for machine I, II and III are 30, 36 and 20 hours respectively. Formulate above LPP to maximize the profit. Also write the standardize form of this LPP. **04**

(c) Solve following transportation problem: **07**

Origin	A	B	C	Availability
X	2	1	2	20
Y	3	4	1	40
Requirement	20	15	25	

OR

(c) Discuss various methods to find the initial feasible solution of transportation problem **07**

Q.3 **(a)** How can you formulate an assignment problem as a standard linear programming problem? Illustrate. **03**

(b) What is the significance of the duality theory of linear programming? Describe the general rule for writing the dual of linear programming problem. **04**

(c) State and discuss the methods employed for solving an assignment problem. **07**

OR

Q.3 **(a)** With the help of quantity cost curve, explain the significance of EOQ. What are the limitation of using the formula for an EOQ? **03**

(b) How would you deal with the assignment problems where **04**

1. Some assignments are prohibited?
2. The objective function is of maximization type?

(c) What is queuing theory? Explain the general structure of the queuing system. Illustrate some queuing situations. **07**

Q.4 **(a)** Information on activities required for a project is as follows: **07**

Name	A	B	C	D	E	F	G	H	I	J	K
Activities Node	1-2	1-3	1-4	2-5	3-5	3-6	3-7	4-6	5-7	6-8	7-8
Duration days	2	7	8	3	6	10	4	6	2	5	6

Draw the network diagram and earliest and latest times.

(b) Determine Total float and free floats for above network (Q 4 (a)). **04**

(c) What are the major comparative characteristics of the PERT and CPM model? What are their limitations, if any? Discuss. **03**

OR

Q.4 **(a)** The following table shows, for each activity of project, the normal and crash time as also normal and crash costs. The contract includes a penalty clause of Rs. 200 per day in excess of 19 days. The overhead cost is Rs 400 per day. **04**

Activity	Time (Days)		Cost (Rs)	
	Normal	Crash	Normal	Crash
1-2	6	4	600	1000
1-3	4	2	600	1400
2-4	5	3	500	1500
2-5	3	1	450	650
3-4	6	4	900	2000
4-6	8	4	800	3000
5-6	4	2	400	1000
6-7	3	2	450	800

Draw the project network.

(b) Determine critical path and cost of completing project in normal time. **03**

(c) Crash the project activities and determine the cost of completing the project in the minimum time. **07**

Q.5 **(a)** Explain briefly the difference in replacement policies of items which deteriorate gradually and items which fail completely. **03**

(b) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are as follows: **04**

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the elapsed time T. Also find T.

(c) A client has an estate agent to sell three properties *A*, *B* and *C* for him and agrees to pay him 5% commission on each sale. He specifies certain conditions. The estate agent must sell property *A* first, and this he must do within 60 days. If and when *A* is sold the agent receives his 5% commission on that sale. He can then either back out at this stage or nominate and try to sell one of the remaining two properties within 60 days. If he does not succeed in selling the nominated property in that period, he is not given opportunity to sell the third property on the same conditions. The prices, selling costs (incurred by the estate agent whenever a sale is made) and the estate agent's estimated probability of making a sale are given below: **07**

Property	*Price of Property in Rs.*	*Selling Costs in Rs.*	*Probability of Sales*
A	12,000	400	0.70
B	25,000	225	0.60
C	50,000	450	0.50

1. Draw up an appropriate decision tree for the estate agent.
2. What is the estate agent's best strategy under Expected monitory value approach (EMV)?

OR

Q.5 **(a)** Describe the steps involved in process of decision making. What are pay off and regret functions? How can entries in regret table be derived from pay off table? **03**

(b) Find the sequence that minimizes the total time required in performing the following jobs on three machines in order ABC. Processing times (in hours) are given in the following table: **04**

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

(c) The following mortality rates have been observed for a certain type of fuse: **07**

Week	1	2	3	4	5
Percentage failing by the end of week	5	15	35	57	100

There are 1000 fuses in use and it costs Rs. 5 to replace an individual fuse. If all fuses were replaced simultaneously it would cost Rs. 1.25 per fuse. It is proposed to replace all fuses at fixed intervals of time, whether or not they have burnt out, and to continue replacing burnt out fuses they fail. At what time intervals should the group replacement be made? Also prove that this optimal policy is superior to the straight forward policy of replacing each fuse only when it fails.

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