

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER- VII EXAMINATION – WINTER 2014**

**Subject Code: 172004****Date: 27/11/ 2014****Subject Name: Production Optimization Techniques****Time: 10:30am TO 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)** What is linear programming? What are the essential characteristics of a linear programming model? Discuss the application of linear programming to managerial decision making. **07**
- (b)** A company manufactures two products A and B. Each unit of B takes twice as long to produce as one unit of A and if the company were to produce only A it would have time to produce 2000 units per day. The availability of the raw material is sufficient to produce 1500 units per day of both A and B combined. Product B requiring a special Ingredient only 600 units can be made per day. If A fetches a profit of Rs.2 per unit and B a profit of Rs.4 per unit, Formulate the optimum product mix. **07**

- Q.2 (a)** Solve, **07**  
 Maximize  $Z = x_1 + 2x_2 + 3x_3$ ,  
 subject to  $x_1 - x_2 + x_3 \geq 4$ ,  
 $x_1 + x_2 + 2x_3 \leq 8$ ,  
 $x_1 - x_3 \geq 2$ ,  
 $x_1, x_2, x_3 \geq 0$
- (b)** XYZ' tobacco company purchases tobacco and stores in warehouses located in the following four cities: **07**

Ware house location	Capacity (Tonnes)
City A	90
City B	50
City C	80
City D	60

The warehouse supply tobacco to cigarette companies in three cities that have the following demands.

Cigarette Company	Demand (Tonnes)
Bharat	120
Janata	100
Red Lamp	110

The following railroad shipping costs per tonne (in hundred rupees) have been determined:

Ware house location	Bharat	Janata	Red Lamp
A	7	10	5
B	12	9	4
C	7	3	11
D	9	5	7

Because of railroad construction, shipments are temporarily prohibited from warehouse at city A to Bharat Cigarette company. Find the optimum distribution for XYZ tobacco company. Are there multiple optimum solutions? If yes identify them.

**OR**

- (b) Explain the similarity and difference between Transportation and an Assignment problem. What problems will be faced if an assignment problem is solved using transportation technique? Explain giving suitable example. 07

- Q.3** (a) Explain the existence of Infeasible solution, Degenerate solution, and Multiple optimum solution in case of Simplex method and Transportation problem. 07

- (b) A city corporation has decided to carry out road repairs on main four arteries of the city. The government has agreed to make a special grant of Rs 50 lakh towards the cost with a condition that the repairs be done at the lowest cost and quickest time. If the conditions warrant, a supplementary token grant will also be considered favorably. The corporation has floated tenders and five contractors have sent in their bids. In order to expedite work, one road will be awarded to only one contractor. 07

		Cost of Repairs (Rs in lakh)			
		R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>
Contractor / Road	C <sub>1</sub>	9	14	19	15
	C <sub>2</sub>	7	17	20	19
	C <sub>3</sub>	9	18	21	18
	C <sub>4</sub>	10	12	18	19
	C <sub>5</sub>	10	15	21	16

Find the best way of assigning the repair work to the contractors and the costs. If it is necessary to seek supplementary grants, what should be the amount sought? Which contractor will be unsuccessful in the bid?

**OR**

- Q.3** (a) Justify the Johnsons rule of sequencing for n jobs - two machines. 07  
Solve the following sequencing problem. Find the idle time on each machine.

Machine	Job				
	A	B	C	D	E
M1	11	13	9	16	17
M2	4	3	5	2	6
M3	6	7	5	8	4
M4	15	8	13	9	11

- (b) Differentiate between single stage and multistage decisions. 07  
Also explain the following :
- Hurwicz criterion
  - Minimax principle
  - EPPI and EVPI
  - Decision making under risk and uncertainty.

- Q.4** (a) What do you understand by Float? Explain the different types of float and their significance. 07

- (b) Listed in the table are the activities and sequencing requirements necessary for the completion of research report. Find the critical path and duration. 07

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Duration	4	2	1	12	14	2	3	2	4	3	4	2
Immediate Predecessors	E	A	B	K	-	E	F	F	F	I,L	C,G,H	D

**OR**

- Q.4** (a) Compare and contrast PERT & CPM. Under what conditions would you recommend scheduling by PERT? State the circumstances where CPM is better technique. 07

- (b) Following are the manpower requirements for each activity in a project. 07

Activity	Normal time	Manpower required	Activity	Normal time	Manpower required
0-1	2	4	4-7	6	3
1-2	3	3	5-7	6	6
1-3	4	3	6-8	5	2
2-4	2	5	7-9	4	2
3-5	4	3	8-9	4	9
3-6	3	4			

Draw the network diagram of the project activities. If only 9 men are available for the execution of the project, then rearrange the activities suitable for leveling the manpower resource.

- Q.5** (a) Define the following (1) Balking (2) Reneging (3) Jockeying. Explain the Kandalls notation for a Queuing system. 07
- (b) Customers arrive at a one window drive in bank according to Poisson distribution with mean 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window including that for the serviced car can accommodate a maximum of 3 cars. Others can wait outside this space? 07
- i. What is the probability that an arriving customer can drive directly to the space in front of the window?
  - ii. What is the probability that an arriving customer will have to wait outside the indicated space?
  - iii. How long is an arriving customer expected to wait before starting service.

**OR**

- Q.5** (a) Discuss briefly about the different types of inventory and various costs involved in inventory problems. 07
- (b) A machine costs Rs 10,000. The operating costs and resale value are given below: 07

Year	1	2	3	4	5	6	7	8
Operating cost	1000	1200	1400	1700	2000	2500	3000	3500
Resale value	6000	4000	3200	2600	2500	2400	2000	1600

Determine at what point of time it should be replaced.

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