Seat No.: _____

Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V- EXAMINATION – SUMMER 2016

Subject Code: 152005Date: 17/05/2016Subject Name: Quantitative Techniques in Management(Inst. Elective - II)Time: 02:30 PM to 05:00 PMTotal Marks: 70

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q:1 A firm uses three machines in the manufacture of three products. Each unit of product A requires 3 hours on machine I, 2 hours on machine II and one hour on machine III. Each unit of product B requires 4 on machine I, one hour on machine II and 3 hours on machine III, while each unit of product C requires 2 hours on each of three machines. The contribution margin of the three products is Rs 30, Rs 40 and Rs 35 per unit res pectively. The machine hours available on three machines are 90, 54 and 93 respectively.
 - 1. Formulate the above problem as a linear programming problem.
 - 2. Obtain optimal solution to the problem by using simplex method. Which of the three products shall not be produced by the firm? Why?
 - 3. Calculate the percentage of capacity utilisation in optimal solution.
 - 4. What are the shadow prices of the machine hours?
 - 5. Is the optimal solution degenerate?
- Q:2 (a) State and discuss the methods employed for solving an assignment 07 problem.
 - (b) Describe the transportation problem and give its mathematical model. 07

OR

- (b) What is degeneracy? How does the problem of degeneracy arise in a **07** transportation problem? How can we deal with this problem?
- Q:3 (a) How will you deal with replacement of items that fail completely and 07 suddenly?
 - (b) Ten jobs are required to be processed on two machines M_1 and M_2 in the **07** order ' M_1 followed by M_2 '. Processing times are given here. Determine the optimal sequences and evaluate for total elapsed time.

Processing Time (hours)										
Jobs:	J_1	J_2	J_3	J_4	J_5	J ₆	J_7	J ₈	J ₉	J ₁₀
Machine	7	8	10	3	7	4	5	8	5	6
Machine	4	2	6	6	5	7	2	6	7	6
M ₂										
OR										

Q:3 (a) The simple engineering company has a machine whose purchase price is 07 Rs. 80,000. The expected maintenance costs and resale price in different years are as given here:

Year	1	2	3	4	5	6	7
Maintenance	1000	1200	1600	2400	3000	3900	5000
cost (Rs.)							
Resale	75	72	70	65	58	50	45
Value('000 Rs)							

After what time interval, in your opinion, should the machine be replaced?

- (b) How does the sequencing technique help the manager? Draw a flow chart 07 to show the method of solution of sequencing problems.
- Q:4 (a) Explain and illustrate the following principles of decision making: 07 1. Laplace 2. Maximin 3. Hurwics 4. Savage 07
 - (b) What are the essential characteristics of operation research? Mention **07** different phases in an operations research study. Point out some limitations of operation research.

OR

- Q:4 (a) What is queuing problem? What are the basic characteristics of queuing system? Describe a single server waiting line model. Give an example from real life, for each of the following models:
 - 1. First come first served,
 - 2. Last come first served
 - 3. Random service pick service
 - 4. Customers stay only if served instantly.
 - (b) A finance manager is considering drilling a well. In the past, only 70% of 07 the wells drilled were successful at 20 meters depth in that area. Moreover, on finding no water at 20 meters, some person in that area drilled it further up to 25 meters but only 20% struck water at that level. The prevailing cost of drilling is Rs. 500 per meter. The finance manager estimated that in case he does not get water in his own well, he will have to pay Rs. 15,000 to buy water from outside for the same period of getting water from the well. The following decisions are considered:
 - 1. Do not drill any well
 - 2. Drill up to 20 meters
 - 3. If no water is found at 20 meters, drill further up to 25 meters

Draw the appropriate decision tree and determine the Finance manager's optimal strategy.

Q:5 A project has the following characteristics:

Activity	Preceding Activity	Expected Completion
		Time (in weeks)
А	-	5
В	А	2
С	А	6
D	В	12
Е	D	10
F	D	9
G	D	5
Н	В	9
Ι	C,E	1
J	G	2
K	F,I,J	3
L	K	9
М	H,G	7
Ν	М	8

1. Draw a PERT network for this project

- 2. Find the critical path and project completion time
- 3. Prepare an activity schedule showing the ES,EF, LS, LF and slack for each activity.
- 4. Will the critical path change if activity G takes 10 weeks instead of 5 weeks? If so, what will be the new critical path?

OR

Q:5

The following table shows, for each activity of a project, the normal and 14 crash times as also the 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.

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	

1. Draw the project network and determine the critical path.

2. Find the cost of completing the project in normal time.

- 3. Crash the project activities and determine the cost of completing the project in minimum time.
- 4. What is the optimal duration of the project and what is the cost involved?
