Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 152005 **Date: 15/05/2017**

Subject Name: Quantitative Techniques in Management (Institute Elective - II)

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 Following are the manpower requirements for each activity in project: **14**

Activity	Normal time (Days)	Manpower required per day
1-2	10	2
1-3	11	3
2-4	13	4
2-6	14	3
3-4	10	1
4-5	7	3
4-6	17	3
5-7	13	5
6-7	9	8
7-8	1	11

1. Draw the network diagram and find out the total float and free float for each activity.
2. The contractor stipulates that during the first 26 days only 4 to 5 men and during remaining days 8 to 11 men only can be made available. Rearrange the activity suitability for levelling the manpower resources, satisfying the above conditions.

Q:2 (a) 1. Solve the following LPP graphically and write your comment. **07**

Maximize $Z = 5x_1 + 2x_2$

Subject to:

$4x_1 + 2x_2 \leq 16$

$3x_1 + x_2 \leq 9$

$3x_1 - x_2 \leq 9$

$x_1, x_2 \geq 0$

(b) 'Every linear programming problem has a mirror image in a form of another linear programming problem called, it's dual.' Do you agree? Explain the primal and dual relationship in detail. How is the knowledge of this relationship beneficial? **07**

OR

(b) Solve the following LPP using simplex method: **07**

Maximize $Z = 40x_1 + 35x_2$

Subject to:

$2x_1 + 3x_2 \leq 60$

$4x_1 + 3x_2 \leq 96$

$x_1, x_2 \geq 0$

Q:3 **(a)** What do you understand by assignment problem? Give a brief outline for solving it. **07**

(b) Solve the following transportation problem to minimize transportation cost: **07**

From \ To	1	2	3	4	5	Supply
1	80	69	103	64	61	12
2	47	100	72	65	40	16
3	16	103	87	36	94	20
4	86	15	57	19	25	8
5	27	20	72	94	19	8
Demand	16	14	18	6	10	

OR

Q:3 **(a)** A company has four sales representatives who are to be assigned to four different sales territories. The monthly sales increase estimated from each sales representative for different sales territories are shown in following table: **07**

Sales representatives	Sales territories			
	I	II	III	IV
A	200	150	170	220
B	160	120	150	140
C	190	195	190	200
D	180	175	160	190

Suggest optimal assignment and the total maximum sales increase per month.

(b) Discuss the various methods of finding the initial feasible solution of transportation problem. **07**

Q:4 **(a)** Using graphical method, determine the minimum time needed to process the two jobs on six machines. The information about machine sequence and the time required by each job on each machine is given below: **07**

Job 1		Job 2	
Machine Sequence	Time (Hours)	Machine Sequence	Time (Hours)
A	4	B	6
B	5	A	3
C	1	C	2
D	3	F	4
E	6	D	3
F	5	E	5

(b) The data on the operating costs per year and resale prices of equipment A whose purchase price is Rs. 10,000 are given here: **07**

Year	1	2	3	4	5	6	7
Operating cost(Rs.)	1500	1900	2300	2900	3600	4500	5500
Resale value (Rs.)	5000	2500	1250	600	400	400	400

What is the optimal period of replacement?

OR

Q:4 **(a)** Explain the concept of group replacement. How the optimal time of group replacement is decided? **07**

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

Q:5 **(a)** Explain and illustrate the following principles of decision making: **07**
(a) Laplace (b) Maximin (c) Maxima (d) Hurwicz

(b) Explain the following terms related to queuing theory. **07**

1. Queue length 2. System length 3. Waiting time in queue 4. Total time in the system 5. Server idle time 6. Deterministic queuing model

OR

Q:5 **(a)** A Finance manager is considering drilling a well. In the past, only 70% of wells drilled were successful at 20 meters depth in that area. Moreover, on finding no water at 20 meters, some persons 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 metre. 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: **07**

i. Do not drill any well;
ii. Drill up to 20 meters, and
iii. If no water is found at 20 meters, drill further up to 25 metres.

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

(b) Explain the applications of quantitative techniques in different field of engineering. **07**

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