

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – WINTER 2013****Subject Code: 161601****Date: 06-12-2013****Subject Name: Modeling Simulation and Operation Research****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) Discuss methodology of Operation Research. **07****(b)** Determine the age at which the following type of machine be replaced: **07**

Cost price = Rs 8,000

Operating Costs = Rs 1000 for the first Year, increasing by Rs 500 every Year

Resale Value = Rs 4000 for first Year, decreasing by Rs 500 every year.

Q.2 (a) Solve the following transportation Problem. **07**

From	To				Availability
	1	2	3	4	
1	8	8	5	12	7
2	6	9	11	9	7
3	10	15	6	13	10
4	6	8	7	8	6
5	11	10	11	13	5
6	8	14	5	12	6
Demand	9	10	8	14	

(b) A dispatcher of the police department has received four requests for police assistance. Currently, six patrol-cars are available for assignment and the estimated response time (in minutes) are shown in the table that follows: **07**

Incident	Patrol Unit					
	1	2	3	4	5	6
I	6	5	3	4	5	6
II	8	6	2	3	7	6
III	4	4	7	6	5	5
IV	3	7	9	8	4	7

(a) Which Patrol units should respond?

(b) What will be the average response time?

OR**(b)** Discuss various rules for network creation. **07****Q.3 (a)** Solve simplex problem **07**Maximize $Z = 7x_1 + 14x_2$ Subject to $3x_1 + 2x_2 \leq 36$ $x_1 + 4x_2 \leq 10$ $x_1, x_2 \geq 0$ **(b)** Write a dual of following problem and then solve that dual. **07**Maximize $Z = 40x_1 + 35x_2$ Subject to $2x_1 + 3x_2 \leq 60$ $4x_1 + 3x_2 \leq 96$ $x_1, x_2 \geq 0$ **OR****Q.3 (a)** Solve following problem by Big-M method. **07**Minimize $Z = 6x_1 + 4x_2$

$$\text{Subject to } 3x_1 + 0.5x_2 \geq 12$$

$$2x_1 + x_2 \geq 16$$

$$x_1, x_2 \geq 0$$

- (b) Solve the problem given below with cutting plane algorithm. 07

$$\text{Maximize } Z = 200x_1 + 300x_2$$

$$\text{Subject to } 2x_1 + 4x_2 \leq 17$$

$$3x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0 \text{ and integer}$$

- Q.4 (a)** A foreign bank is considering opening a drive-in window for customer service. Management estimates that customers will arrive for service at the rate of 12 per hour. The teller, whom it is considering to staff the window, can serve customers at the rate of one every three minutes. Assuming Poisson arrivals and exponential service, find (i) utilization of teller, (ii) average number in the system, (iii) average waiting time in the line, and (iv) average waiting time in the system. 07

- (b) A bakery keeps stock of a popular brand of cakes. Previous experience shows the daily demand pattern for the item with associated probabilities, as given: 07

Daily Demand(Nos)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use following sequence of Random number to simulate the demand for next 10 days. Also find Average demand per day.

Random Numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

OR

- Q.4 (a)** The Hi-power Company provides electric power, supplied by four big generators, to an industrial area. The generators are subject to an occasional breakdown and, from the past data, it is known that a generator develops problem, on an average, once in every months. The company has a repair crew which is entrusted with task of repairing the faulty generators. From the past records, it is known that it takes 2 months, on an average, for a generator to be repaired. Calculate 07

(a) The proportion of time there shall be no generators to be repaired.

(b) The average number of generators waiting repairs

(c) The average waiting time for repair of a defective generator to begin.

- Q.4 (b)** A confectioner sells confectionery items. Past data of demand per week in hundred kilograms with frequency is given below: 07

Demand/Week	0	5	10	15	20	25
Frequency	2	11	8	21	5	3

Using the following sequence of random number, generate the demand for next 15 weeks. Also find average demand per week.

Random numbers: 35, 52, 90, 13, 23, 73, 34, 57, 35, 83, 94, 56, 67, 66, 60

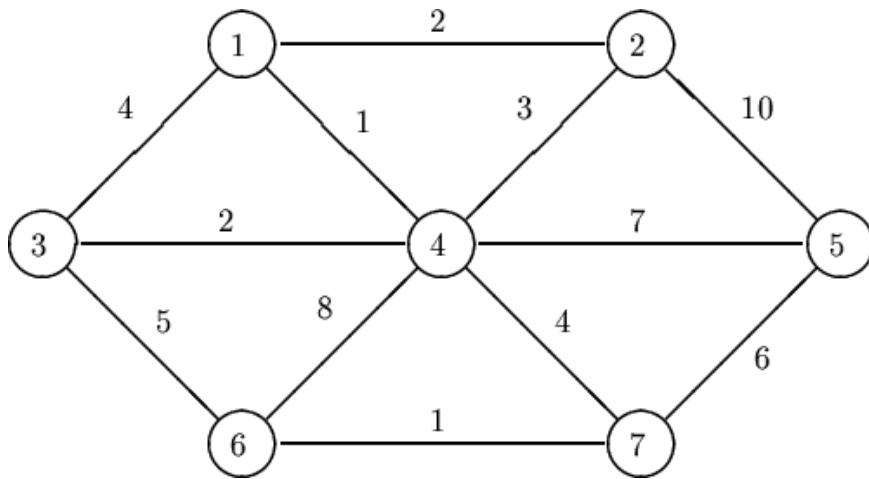
- Q.5 (a)** A small project consist of seven activities for which the relevant data are given below: 07

Activity	Preceding Activities	Activity duration(Days)
A	-	4
B	-	7
C	-	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

(i) Draw the network and find the project completion time

(ii) Calculate total float for each of the activities.

- (b) Solve the minimum-span problem for the network given below (Show all step separately.) 07



OR

- Q.5 (a)** Given that a project involves activities A, B, C, ..., I; each requiring completion time, in days, as per the following table: **07**

Activity	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10

Given that activity A precedes D and E; activities B and D precede activity F; activity C precedes G; activities B and G precedes H, and activities F and G precede I, draw network and calculate: (i) Total Float, (ii) Free float, (iii) Independent float, (iv) Critical Path, and (v) Project Completion time.

- (b)** (a) For an activity in a PERT network, the following information is available: **07**

Expected time = 9.5 days

Optimistic time = 5 days

Variance = 6.25day^2

Calculate most likely and pessimistic times of this activity

(b) The critical activities of a project, their expected duration and standard deviations (in weeks) are given here:

Activity	B	E	G	H	K	L
Expected duration	12	3	8	7	5	6
Standard deviation	$2/3$	$1/3$	2	$5/3$	$4/3$	0

- (i) Find the probability that the project will be completed in 45 weeks.
- (ii) If manager wants the probability to be 90 percent of completing the project in time, how many weeks prior to the deadline should she start the project?
