

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-V Examination-Nov/Dec.-2011

Subject code: 152005**Date: 03/12/2011****Subject Name: Quantitative Techniques in Management****Time: 2.30 pm -5.00 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) At a polyclinic three facilities of clinical laboratories has been provided for blood testing. Three lab technicians attend to the patients. The technicians are equally qualified and experienced and they take 30 minutes to serve a patient. This average time follows exponential distribution. The patients arrive at an average rate of 4 per hour and this follows Poisson's distribution. The management is interested in finding out the following:- 7

1. Expected number of patients waiting in the queue.
2. Average time that a patient spends at the polyclinic.
3. Probability that a patient must wait before being served.
4. Average percentage idle time for each of the lab technicians.

(b) Four jobs 1,2,3 and 4 are to be processed on each of the five machines M_1, M_2, M_3, M_4, M_5 in the order M_1, M_2, M_3, M_4, M_5 . Determine total minimum elapsed time if no passing off is allowed. Also find out the idle time of each of the machines. Processing times are given in the matrix below. 7

Jobs	Machines				
	M_1	M_2	M_3	M_4	M_5
1	8	4	6	3	9
2	7	6	4	5	10
3	6	5	3	2	8
4	9	2	1	4	6

Q.2 (a) A retailer deals in two items only, item A and item B. He has Rs 50,000 to invest and a space to store at the most 60 pieces. An item of A costs him Rs 2,500 and B costs him 500. Net profit to him on items A is Rs 500 and on item B is Rs 150. If he can sell all the items that he purchases, how much should he invest his amount to have maximum profit? Give a mathematical formulation to the linear programming problem. 7

(b) Solve the following problem using simplex method. 7

$$\text{Maximise } Z = 3x_1 + 5x_2 + 4x_3$$

$$2x_1 + 3x_2 \leq 8$$

$$2x_1 + 5x_2 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

$$x_1, x_2, x_3 \geq 0$$

OR

- (b) Solve the following problem using simplex method. 7

$$\text{Minimise } Z = 5x_1 + 6x_2$$

$$2x_1 + 5x_2 \geq 15$$

$$3x_1 + x_2 \geq 12$$

$$x_1, x_2 \geq 0$$

- Q.3 (a)** Explain briefly the meaning and objectives of network analysis with illustration. 7
Also give a few limitations of this technique.
- (b)** A project has eleven distinct activities which the management wants to analyse 7
by using the PERT technique. Details of different related data are as follows:

Activity	Predecessor Activity	Time (Weeks)		
		(a)	(m)	(b)
A	Nil	1	1	1
B	Nil	2	2	2
C	B	2	4	6
D	B	1	4	1
E	C	3	5	1
F	B	5	7	3
G	B	4	8	6
H	C	1	9	5
I	E,F	4	10	5
J	G	6	11	4
K	H,I,J	4	12	8

You are required to

1. Draw a network using the above data.
2. Determine the critical path and mark it on the diagram.
3. Calculate EST and LST for each activity.
4. If the management wants to be sure of completing the project in time, what is the duration?

OR

- Q.3 (a)** Distinguish between PERT and CPM. Under what circumstances would you 7
consider PERT as opposed to CPM in project management.
- (b)** Draw a network with the following information regarding activities and duration 7
and find critical path and total project duration.

Activity	Duration(Weeks)	Activity	Duration(Weeks)
1-2	4	5-8	3
2-3	3	5-9	3
2-4	2	6-8	5
2-5	4	7-8	4
2-5	5	8-10	4
3-6	4	9-10	3

- Q.4 (a)** Five lectures by experts are to be scheduled so as not to conflict with one another. The lectures are to be delivered in the afternoon on week days only, otherwise, because of other close schedules; certain students will be forced to drop out these lectures. The following table indicates the number of absentees lecture wise and day wise. Scheduled these lectures in such a way as to minimize the total number of students forced to remain absent. 7

Lecture/ Day	1	2	3	4	5
Mon	3	2	3	9	10
Tues	11	5	9	10	2
Wed	1	3	8	2	4
Thurs	8	11	10	5	2
Fri	8	6	5	6	9

- (b)** A company is spending Rs. 1200 on transportation of its units from three plants to four distribution centres. The supply and demand of units with unit cost of transportation are given as under. 7

PLANTS	DISTRIBUTION CENTRES				Supply
	D ₁	D ₂	D ₃	D ₄	
A	20	30	50	17	7
B	70	35	40	60	10
C	40	12	60	25	18
Demand	5	8	7	15	

What can be the maximum saving by optimal scheduling?

OR

- Q.4 (a)** What is the decision making? Explain the various steps involved in decision-making process 7
- (b)** Solve the following transportation problem using NWCM and LCM. 7

PLANTS	STORES				Supply
	D1	D2	D3	D4	
A	8	8	5	12	7
B	6	9	11	9	7
C	10	15	6	13	10
D	6	8	7	8	6
E	11	10	11	13	5
F	8	14	5	12	6

Demand	9	10	8	14	
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- Q.5 (a)** A truck owner finds from his past records that the manufacturing cost of a truck (whose purchase price is Rs 30,000) during the first 8 years of its life and the resale price at the end of each year is as follows: 7

Year	1	2	3	4	5	6	7	8
Maintenance Cost(Rs)	36000	48000	60000	72000	84000	96000	108000	120000
Resale Price (Rs)	200000	150000	100000	80000	70000	60000	50000	40000

What is the best replacement policy?

- (b)** Discuss in brief the significance and scope of Operations Research in modern business management. 7

OR

- Q.5 (a)** Discuss briefly various steps for solving an Operations Research problem. Illustrate with one example from the functional area of your choice. 7

- (b)** A computer contains 10,000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs. 1 only. If all the resistors are replaced at the same time, the cost per resistor would be reduced to 35 paisa. The percent surviving at the end of month 't' is given below: 7

Month	1	2	3	4	5	6
% surviving at the end of the month	100	97	70	30	15	0

What is the optimum replacement plan?
