

Total No. of Questions : 12]

SEAT No. :

P3588

[Total No. of Pages : 6

[4959]-1059

B.E. (Mechanical Engg. S/W) (End Semester)

b: OPERATION RESEARCH

(2012 Pattern) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Figures to the right indicate full marks.
- 3) Use of non programmable calculator is permitted.
- 4) Assume suitable data, if necessary.

Q1) The Poona Decorators Company is planning to make up floral arrangements for the forth coming X-mas festival. The company has available the following supply of flowers at the costs shown. [8]

Types	Number available	Cost/flower (Rs.)
Red Roses	800	0.2
Gardenias	456	0.25
Carnations	4000	0.15
White Roses	920	0.2
Yellow Roses	422	0.22

These flowers can be used in any of the four popular arrangements whose selling prices are as follows.

Arrangement	Make UP Requirements	Selling Price
Economy	4 Red Roses, 2 Gardenias, 8 Carnations	Rs. 6
May Time	8 White Roses, 5 Cardenias, 10 Carnations, 4 Yellow Roses	Rs. 8
Spring Color	9 Red Roses, 10 Carnations, 9 white roses, 6 Yellow Roses	Rs. 10
Deluxe Rose	12 Red Roses, 12 White Roses, 12 Yellow Roses	Rs. 12

Formulate the L.P. problem which allows the company to determine how many units of each arrangements should be made up in order to Maximum Profit.

P.T.O.

OR

Q2) a) Explain steps in decision making. [4]

b) Explain decision tree with suitable example. [4]

Q3) Solve following problem by VAM to minimize transportation cost. Cell entries are transportation cost per unit. [8]

		Demand				Available
		D1	D2	D3	D4	
SOURCE	S1	3	4	4	5	350
	S2	3	5	4	2	450
	S3	3	3	4	3	200
	Required	200	400	300	200	

OR

Q4) Solve following Assignment Problem to minimize cost. [8]

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

Q5) Solve following Problem by Sub-Game Method. [6]

		B's Strategies	
		B1	B2
A's Strategies	A1	4	2
	A2	3	8
	A3	2	12

OR

Q6) A ABC Co. Ltd. is considering investments X, Y and Z. Each requires an investment of Rs. 5000 and each has economic life of 3 years and total cash flow over that period of Rs. 6100. The pattern of cash inflow differs as below for each project. **[6]**

YEAR	Annual Cash Inflows in Rs.		
	X	Y	Z
1	1050	2000	3050
2	2000	2050	2050
3	3050	2050	1000

Calculate the Net Present Value (NPV) of each proposal if the required rate of return is 10% and find whose proposal is better.

Q7) a) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs. 50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find **[8]**

- i) The Economic Lot Size
- ii) The Total optimal cost including capital cost
- iii) The Total weekly profit if the item is sold for Rs. 55 per unit.

b) The purchase Price of a machine is Rs. 52,000. The installation charges amount is Rs. 14,400 and its scrap value is Rs. 6,400. The maintenance cost in various years is given below.

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	3000	4000	6000	8400	11600	16000	19200

After how many years should the machine be replaced? Assume that the machine replacement can be done only at the year end. **[8]**

OR

- Q8)** a) The purchasing manager of a distillery company is considering three sources of supply for oak barrels. The first supplier offers any quantity of barrels at Rs. 150 each. The second supplier offers barrels in lots of 150 or more at Rs. 125 per barrel. The third supplier offers barrels in lots of 250 or more at Rs. 100 each. The distiller uses 1500 barrels a year at a constant rate. Carrying costs are 40% and it costs Rs. 400 to place an order. Calculate the total annual cost for the orders placed to the probable supplier and find out the supplier to whom the order should be placed. **[8]**

The cost/unit is shown in the table below

Supplier	Quantity of barrels	Cost/unit
First	Any	Rs. 150
Second	150 and above	Rs. 125
Third	250	Rs. 100

- b) Fleet cars have their costs increasing as they continue in service due to increased direct operating cost and increased maintenance. The initial cost is Rs. 3800 and the resale value drops as time passes until it reaches a constant value of Rs. 600. Given the cost of operating, maintaining and year end resale value. Determine the proper length of service years after which cars should be replaced. **[8]**

Years of service	1	2	3	4	5
Year end resale value	2000	1200	800	700	600
Annual operating cost	1600	1900	2200	2500	2800
Annual Maintenance cost	400	500	700	900	1100

- Q9)** a) Customer arrive at a bank counter manned by a single cashier according to Poisson distribution with mean arrival rate 6 customer/hour. The cashier attends the customer on first come first serve basis at an average rate of 10 customers/hour with the service time exponential distribution. Find **[8]**
- The probability of the number of arrivals (0 to 5) during 15 minute interval and 30 minute interval.
 - The probability that the queuing system is idle.
 - The time a customer should expect to spend in the queue.

- b) Find the sequence that minimizes the total time required for performing the following jobs on three machines in order ABC. Processing time in minute is given below. [8]

Jobs →	I	II	III	IV	V	VI	VII
Machine A	3	8	7	4	9	8	7
Machine B	4	3	2	5	1	4	3
Machine C	6	7	5	11	5	6	12

OR

- Q10)** a) Assume a single channel service system of a library in a school. On an average 10 students visit per hour and book issue rate is 14 students/hour. [8]

Determine :

- i) Probability of libration being idle.
 - ii) Probability that at least 4 students in the system.
 - iii) Expected time that student is in queue.
- b) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are given as : [8]

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimizes the total elapsed time. Also find Total elapsed time and idle time for machine A and machine B.

- Q11)** a) Discuss Floats. [4]
- b) Information on the activities required for a project is as follows. Find critical path, TF, FF, IF. [12]

Activity	1-2	1-3	1-4	2-5	3-5	3-6	3-7	4-6	5-7	6-8	7-8
NT	2	7	8	3	6	10	4	6	2	5	6

OR

Q12) a) Write difference between PERT and CPM. [4]

b) A small project is composed of scrap activities whose time estimates are listed below : [12]

Activites		To	Tm	Tp
I	J			
1	2	3	6	15
1	6	2	5	14
2	3	6	12	30
2	4	2	5	8
3	5	5	11	17
4	6	3	6	15
6	7	3	9	27
5	8	1	4	7
7	8	4	19	28

- i) Draw network diagram.
- ii) Calculate the length and variance of the critical path.
- iii) What is the approximate probability that the job on critical path will be completed in 41 days?

