Total No. of Questions : 12]

SEAT No. :

P1966

[Total No. of Pages : 5

[4859]-1023

B.E. (Mechanical)

OPERATION RESEARCH

(2012 Pattern)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q. 1 or Q.2, Q. 3 or Q.4, Q. 5 or Q.6, Q. 7 or Q.8, Q. 9 or Q.10, Q. 11 or Q.12.***
2) ***Answers in one answer-book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define operations research. Explain applications of operations research techniques. **[4]**

b) Old hens can be bought for Rs.2.00 each but young ones costs Rs. 5.00 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week. Each egg costs Rs. 0.30. A hen costs Rs.1.00 per week to feed. If the financial constraint is to spend Rs.80.00 per week for hens and the capacity constraint is that total number of hens cannot exceed 20 hens and the objective is to earn a profit more than Rs.6.00 per week. Formulate the L.P. Problem. **[4]**

OR

Q2) a) Explain the various environments in which decision are made. **[4]**

b) Explain minimax principle and maximin principle with suitable examples **[4]**

Q3) Four factories, A, B, C and D produce sugar and the capacity of each factory is given below: **[8]**

Factory A produces 10 tons of sugar and B produces 8 tons of sugar, C produces 5 tons of sugar and that of D is 6 tons of sugar. The sugar has demand in three markets X, Y and Z. The demand of market X is 7 tons, that of market Y is 12 tons and the demand of market Z is 4 tons. The following matrix gives the transportation cost of 1 ton of sugar from each factory to the destinations. Find the initial basic feasible solution to the following transportation problem using Vogel's approximation method.

P.T.O.

Factories	Cost in Rs. per ton (× 100)markets			Availability in tons
	X	Y	Z	
A	4	3	2	10
B	5	6	1	8
C	6	4	3	5
D	3	5	4	6
Requirement in tons	7	12	4	Σ b = 29, Σ d = 23

OR

Q4) Five jobs are to be assigned to 5 machines to minimize the total time required to process the jobs on machines. The times in hours for processing each job on each machine are given in the matrix below. By using assignment algorithm make the assignment for minimizing the time of processing. **[8]**

Machines (time in hours)

Jobs	V	W	X	Y	Z
A	2	4	3	5	4
B	7	4	6	8	4
C	2	9	8	10	4
D	8	6	12	7	4
E	2	8	5	8	8

Q5) A and B play a game in which each has three coins a 5p, a10p, and 20p. Each player selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, A wins B's coin; if the sum is even, B wins A's coin. Find the best strategy for each player and the value of the game. **[6]**

OR

Q6) a) Explain 'Average Rate of Return (ARR) Method' in brief. **[2]**

b) A project cost Rs. 50,000/- and has a scrap value of Rs. 10,000/-. Its stream of income depreciation and taxes during first five years is Rs. 10,000/-, Rs. 12,000/- and Rs. 14,000/-, Rs. 16,000/- and Rs. 20,000/- respectively. Assume depreciation on straight line basis and 50% tax rate, Calculate the accounting rate of return for the project. **[4]**

Q7) a) The production department for a company requires 3600 kg of raw material for manufacturing a particular item/year. It has been estimated that cost of placing an order is Rs. 36 and cost of carrying an inventory is 25% of investment in inventories. The price is Rs. 10/kg. Determine **[8]**

i) EOQ

ii) Optimum order

b) A JCB excavator operator purchases the machine of Rs. 15,00,000. The operating cost and the resale value of machine is given below: **[8]**

Year	1	2	3	4	5	6	7
Operating Cost (‘Rs.)	30,000	32,000	36,000	40,000	45,000	52,000	60,000
Resale value in (Lacks of ‘Rs.)	12	10	8	5	4.5	4	3

When should the machine be replaced?

OR

Q8) a) A fast moving item has a demand of 18,000 units/year. The cost of one procurement is Rs. 50 and inventory carrying or holding cost is Rs. 1.20 per unit/per year. It is assumed that supply is received as soon as the order is placed and no shortage or stock permitted. Cost of one unit is Rs 8. Determine: **[8]**

i) EOQ

ii) Number of Orders/Year

iii) Interval between orders

iv) Total cost per year

b) A fleet owner finds form his past records that the cost per year of running a truck and resale values whose purchase price isRs. 6000/- are given as under. At what stage the replacement is due? **[8]**

Year	1	2	3	4	5	6	7
Running cost in Rs.	1000	1200	1400	1800	2300	2800	3400
Resale value in Rs.	3000	1500	750	375	200	200	200

Q9) a) A super market has two sales girls at the sale counter. If the service time for each customer is exponential with a mean of 4 minutes and if people arrive in a passion fashion at the rate of 10 an hour then calculate the :**[8]**

i) Probability that a customer has to wait for service.

ii) Expected percentage of the idle time for each sales girls.

iii) If a customer has to wait, what is the expected length of his waiting.

b) Four jobs 1, 2, 3 and 4 are to be processed on each of four machine A, B, C and D in order ABCD. The processing time in minutes are given in table below. Find the sequence for job position and minimum elapsed time. Also calculate idle time for machine. **[8]**

Job	1	2	3	4
Machine A	58	30	28	64
Machine B	14	10	12	16
Machine C	14	18	16	12
Machine D	48	32	44	42

OR

Q10) a) A T.V. repairman finds that the time spent on his jobs have an exponential distribution with mean of 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately poisson with an average rate of 10 per 8 hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? **[8]**

b) There are seven jobs (tasks) each of which has to go through the machines A and B in order (AB). Processing time in hrs. are given below. Determine a sequence that will minimize the total elapsed time, also calculate idle time and total elapsed time. **[8]**

Jobs (task)	1	2	3	4	5	6
Machine A	3	12	15	6	10	11
Machine B	8	10	10	6	12	1

Q11) a) A small project include seven major activities whose time destinations are listed in the table below : **[8]**

Table 10.9

Activity	T_o	T_l	T_p
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

Draw network and find :

i) Expected duration and variance of each activity.

ii) Expected project length.

iii) Variances and standard deviation of project length.

iv) Probability of getting project completed 3 weeks earlier than expected. Maximum delay not more than 3 weeks.

v) If project due date is 18 weeks, what is the probability of meeting the due date.

b) With the help of a single server queuing model having inter-arrival and service times constantly 1.4 minutes and 3 minutes respectively, explain discrete simulation technique taking 10 minutes as the simulation period. Find from this average waiting time and percentage of idle time of the facility of a customer. Assume that initially the system is empty and the first customer arrives at time t = 0. **[8]**

OR

Q12) a) Find critical path by drawing network, find the total duration for all projects. The activities presidence and their delays are given below :**[12]**

Activity	Predecessor	Duration
A	-	4
B	A	6
C	A	4
D	C	7
E	C	9
F	C	8
G	E	6
H	F	5
I	G,H	4
J	B	3
K	J	2

b) A firm manufacturing two components, radio and transistors which must be processed through assembly and finishing department. Assembly has 90 hours available; finishing can handle upto 72 hours of work. Manufacturing one radio needs 6 hours in assembly and 3 hours in finishing. Each transistor needs 3 hours in assembly and 6 hrs in finishing. If profit is Rs. 120 per radio and Rs. 90 per transistor, calculate the best combinations of radio and transistor to realize profit of Rs. 2100. **[4]**

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