Model Question Paper

Seventh Semester B.Tech Degree Examination

13.706.4 OPTIMIZATION TECHNIQUES (Elective –II) (F)

Time : 3 hrs   Max marks : 100

PART A

(All questions are compulsory. Each question carries 4 marks)

1. Solve graphically, max $z = 3x_1 - 2x_2$ subject to $x_1 + 2x_2 \leq 2$, $2x_1 + 4x_2 \geq 8$ and $x_1, x_2 \geq 0$.
2. Define operation research.
3. Find an initial solution for the transportation problem by Vogel's method with m =4 and n =3 where $c_{11}=2$, $c_{12}=7$, $c_{13} = 4$, $c_{21} = 3$, $c_{22} =3$, $c_{23} = 1$, $c_{31} =5$, $c_{32}=4$, $c_{33} =7$, $c_{41} =1$, $c_{42} =6$, $c_{43} = 2$, where $O_1 = 5$, $O_2 = 8$, $O_3 = 7$, $O_4 =14$ and $D_1 =7$, $D_2 = 9$, $D_3 = 18$.
4. Briefly define Hurvitz criterion.
5. A project has the following activities with their durations.

Activity	:	A	B	C	D	E	F	G	H
Time (days)	:	1	2	2	2	4	1	4	8
Preceding activity	:	_	_	_	A,B	B,C	C	D	E,F,G

    Draw the project network and indicate the critical path.

PART B

(Answer one full question out of the two from each module. Each question carries 20 marks.)

Module I

6. Solve (a)max: $z = 3x_1 + 5x_2 + 4x_3$. subject to $2x_1 + 3x_2 \leq 8$, $2x_2 + 5x_3 \leq 10$, $3x_1 + 2x_2 + 4x_3 \leq 15$, $x_1, x_2, x_3 \geq 0$.

   (b)Max $z = 6x_1 + 4x_2$ subject to $2x_1 + 3x_2 \leq 30$, $3x_1 + 2x_2 \leq 24$, $x_1 + x_2 \geq 3$, $x_1, x_2 \geq 0$

7(a) Write the simplex algorithm.

  (b) A company produces three types of leather belts, namely A, B and C. The unit profits from these three varieties are Rs 10, Rs5 and Rs 7, respectively. Leather is sufficient for only 800 belts per day. Belt A requires thrice the time of belt B and belt C requires twice the time of belt B. If all the belts of type B are produced, a maximum of 1000 belts per day can be produced. Belt A requires a fancy buckle and 150 buckles per day are available. There are sufficient number of belts for other varieties. Determine how many belts of each type can be produced to maximize the profit.

Module II

8(a)Solve the transportation problem to maximize the profit

From/To	1	2	3	4	Supply
I	15	51	42	33	23
II	80	42	26	81	14
III	90	40	66	60	33
Demand	23	31	16	30	

b) Solve the assignment problem.

Tasks/Persons	I	II	IIII	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4

9 (a) Use transportation algorithm to solve

Sources/Destinations	W_1	W_2	W_3	W_4	Supply
O_1	190	300	500	100	70
O_2	700	300	400	600	90
O_3	400	100	600	200	180
Demand	50	80	70	140	

b)Solve the assignment problem to minimize the cost

Jobs/Persons	I	II	III	IV
A	2	3	4	5
B	4	5	6	7
C	7	8	9	8
D	3	5	8	4

Module III

10(a) Briefly explain Replacement Model.
(b) The cost of a machine is Rs 6100 and its scrap value id Rs 100.The maintenance costs found from experience are as follows:

Year	1	2	3	4	5	6	7	8
Maintenance Cost(Rs)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

11 (a) The maintenance cost and resale value per year of a machine whose purchase price is Rs 7000 is given below.

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	900	1200	1600	2100	2800	3700	4700	5900
Resale value In Rs	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

(b) Explain how the theory of replacement is used in replacement of items whose maintenance cost varies with time.

Module IV

12 (a) Determine Early start T_E and Latest start T_L for each event. Draw the network diagram and identify the critical path

Activity	1-2	1-3	1-4	2-5	4-6	3-7	5-7	6-7	5-8	6-9	7-10	8-10	9-10
Duration	10	8	9	8	7	16	7	7	6	5	12	13	15

(b) A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find i) Average number of customers in the system.   ii) Average number of customers in queue. iii) Average time a customer spends in the system. iii) Average time a customer waits before being served

13 (a) The expected times and variances for the activities of a PERT network are given below. Determine the critical path. If the scheduled completion time is 32 months, find the probability of completion on schedule.

Activity :	1-2	1-3	2-4	2-5	3-4	3-6	4-5	4-6	5-7	6-7
Expected Time(months):	4	5	2	12	3	8	10	6	8	10
Variance :	8	3	1	5	2	4	4	2	1	8

(b) A tax consulting firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the average 48 persons arrive in an 8-hour day. Each tax adviser depends 15 minute on the average on an arrival. If the arrivals are Poissonly distributed and service times are according to exponential distribution, find a) the average no of customers in the queue b) average waiting time for a customer   c) The probability that a customer has to wait before he gets service.