Q. No. MS - 331 / 009

B. Tech./Odd
2017-18/Reg

2017-18

OPTIMIZATION TECHNIQUE

MS - 331

Full Marks : 70 Time : Three Hours

The figures in the margin indicate full marks.

Attempt any *five* questions. 14×5=70

1. Write short notes on any *two* : 7×2

   A. Analytical Hierarchical Problem (with example).

   B. Fractional Programming (with example).

   C. Strong Duality Theorem (with example).

   D. Two Phase Method (with example).

2. A company produces three parts that require the use of lathe and a drill press. The two machines operate 10 hour a day. The following table in minutes required by each part :

Part	Lathe	Drill press
1	5	3
2	6	2
3	4	6

P.T.O.

It is needed to balance the use of the two machines by requiring the difference between their total operation times not to exceed 30 minutes. The demand limits the number of units produced of each part to at least 10 units.

A. Formulate the problem as a goal programming model.

B. Solve the problem while omitting part 3 and ascribing priority on the operations on part 1. 5+9

3. Apply revised simplex technique on the following intermediate table to determine the original problem and the optimal solution (when X and Y are main variables and S1 and S2 are slack variables and Z is the objective function which is to be maximized).

	Z	X	Y	S1	S2	SOLUTION
BASIS	1	0	–6	0	–3	5
S1	0	0	3	1	2	2
X	0	1	–1	0	–1	3

14

4. Cars are shipped from three distribution centres to four dealers. The shipping cost is based on the mileage between the source and the destination, and is independent of the truck makes the trip with a partial or full truck load. The following table summarizes the mileage between sources and the destinations along with the supply and demand figures **in terms of number of cars**. A full truckload carries 20 cars. The transportation cost per truck-mile is $25.

	Dealer 1	Dealer 2	Dealer 3	Dealer 4	Supply
Centre 1	100	150	200	140	250
Centre 2	50	70	60	80	200
Centre 3	40	90	100	150	150
Demand	100	200	150	150	

Find out the optimal schedule. 14

5. (a) Discuss the working principle of 'Dual simplex method' in solving a linear programming problem. Why is the method called as dual simplex method?

(b) Maximize $Z = 5x_1 + 6x_2$

subject to $-x_1 + 5x_2 \geq 3$

$4x_1 + 7x_2 \leq 8$ and $x_1, x_2 \geq 0$

Prepare the dual form of the above Primal model.

(c) What happens if a new constraint $x_1 + 2x_2 \leq 5$ is added with the two other constraints? 2+8+4

6. (a) Define an assignment problem. How can we solve a maximization assignment problem?

(b) A sales person who lives in Basin must call once a month on four customers located in Wald, Bon, Mena and Kiln. The following table gives the distances in miles among the different cities. Formulate the problem & determine the optimal schedule.

P.T.O.

	Basin	Wald	Bon	Mena	Kiln
Basin	0	120	220	150	210
Wald	120	0	80	110	130
Bon	220	110	0	160	185
Mena	150	110	160	0	190
Kiln	210	130	185	190	0

4+10

7. A factory produces locks and lamps. The two products are to be routed through Moulding Dept., Assembly Dept and Finishing Dept. Capacity of different depts. Per week is given below :

	Lock (in dozens)	Lamp (in dozens)
Moulding dept	120	200
Assembly dept	240	80
Finishing dept	150	100

Estimated profit on a lock and a lamp are Rs. 4 and Rs. 3 respectively. What will be the maximum profit if all produced items are sold? What will happen if the profit level of the lamp becomes Rs. 5 ? Will there be any change when the capacity of the Assembly dept becomes 200 dozens? 14
