SIDDHARTH INSTITUTE OF ENGINEERING & TECHONOLOGY: PUTTUR

Department of MBA- II Semester

SUB: OPERATIONS RESEARCH (19MB9013)

Unit – I

1. Define Operations Research. Explain the process of Operations Research. [10M]
2. Describe the phases of Operations Research. [10M]
3. What are the major applications of Operations Research [10M]
4. A company manufactures two product A and B. Both the products pass through two machines M1 and M2. The time require to process each unit of products A and B on each machine and available capacity of each machine is given below

Product	Machine M1(processing time)	Machine M2 (processing times)
A	6	2
B	4	4
Available capacity	3600	2000

The availability of materials is sufficient to produce 500 units of A and 400 units of B. Each unit of product A gives a profit of rupees 25 and each unit of product B gives a profit of rupees 20. Construct a linear programming model to determine the quantity of each product to be manufactured to maximize profit.

5. Maximize Z = 11x1+4x2
   Constraints 7x1+6x2 <=84
   4x1+2x2<=32
   .x1>=0, x2>=0
   Solve the above liner programming problem by using graphical method. [10M]
6. Maximize Z = 100x1+125x2
   Constraints 4x1+6x2 <=24
   4x1+2x2<=16
   x1>=0, x2>=0
   Solve the above liner programming problem by using graphical method.
7. A firm manufactures two types of products A and B and sells them at a profit of Rs.2 on type A and Rs. 3 on type B.Each product is processed on two machines G and H.Type A requires one minute of processing time on G and two minutes on H : type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hour 40 minutes while machine H is available for 10 hours during any working day.Formulate the problem as a Linear programming problem? [10M]

8. Solve the following problem by Simplex method. [10M]

Max. $Z = 8x_1+19x_2+7x_3$
Subject to constraints
$3x_1+4x_2+x_3 \leq 25$
$x_1+3x_2+3x_3 \geq 50$
x1>=0, x2>=0.

9. What is operations research and explain briefly its applications in industrial organizations? 10M

10. Explain steps involved in solving simplex method? [10M]

UNIT II

1. Find Initial basic feasible solution for the below problem

	W1	W2	W3	W4	Supply
F1	10	0	20	11	20
F2	12	7	9	20	25
F3	0	14	16	18	15
Demand	10	15	15	20	

2. Find Initial basic feasible solution for the below problem through VAM

	W1	W2	W3	W4	Supply
F1	10	0	20	11	20
F2	12	7	9	20	25
F3	0	14	16	18	15
Demand	10	15	15	20	

3. Find Initial basic feasible solution for the below problem by a) least cost method
   b) North-West corner Method.

	S1	S2	S3	S4	Supply
O1	6	4	1	5	14
O2	8	9	2	7	16
O3	4	3	6	2	5
Demand	6	10	15	4	

4. What is Degeneracy in transportation and unbalanced transportation problem?
5. Write the procedure of solving assignment problem by Hungarian method.

6. Solve the following assignment problem

Operation /task	1	II	III	IV
A	**7**	**15**	**6**	**0**
B	**0**	**5**	**16**	**13**
C	**23**	**4**	**3**	**0**
D	**9**	**16**	**14**	**0**

7. Solve the following assignment problem

Operation /task	I	II	III	IV	V
A	**20**	**15**	**18**	**20**	**25**
B	**18**	**20**	**12**	**14**	**15**
C	**21**	**23**	**25**	**27**	**25**
D	**17**	**18**	**21**	**23**	**20**
E	**18**	**18**	**16**	**19**	**20**

8) Find Assignment cost for the below problem through Hungarian method.

	1	2	3	4
A	10	12	9	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

9) Write short notes on the following
   a) Hungarian Method of assignment
   b) Un balanced assignment problem
10) Find Assignment cost for the below problem through by using travelling salesmen.

	1	2	3	4
A	10	12	9	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

UNIT-III

1) Define Game theory. Explain pure strategies and mixed strategies

2) Solve the following game

	B	
A	7	4
	5	6

3) Write the steps of dominance rule in Games?

4) What is two person zero sum game? What are mixed strategies? Explain?

5) For the game given below determine optimal strategies for A

	B	
A	3	1
	2	7
	1	11

6) The payoff matrix of a competitive situation is as under?

	B		
A	7	6	3
	-2	2	-3
	5	9	7

7) For the game given below determine the optimal strategies for A by graphical method?

	B	
A	4	2
	3	8
	2	12

8) What are the methods of games without saddle points?

9) Calculate the value of the game and find the best strategies for player A and Player B.

	B		
A	1	3	6
	2	1	3
	6	2	1

10) For the game given below determine the optimal strategies for A by graphical method?

	B		
A	2	4	10
	9	6	3

UNIT – IV

1) Define Project. What are the steps involved in CPM?
2) Find the Critical Path for the following problem

activity	1-2	1-3	2-4	3-4	4-5
duration	6	2	4	3	4

3) Write short notes on a) Project Crashing b) PERT.
4) Find the Critical Path and duration of the project.

activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
duration	6	2	4	3	4	3	6

5) What is a project? explain rules for drawing a network
6) Draw the network and identify the critical path.

Activity	Duration
1-2	4
1-3	17
2-3	4
2-4	5
3-4	0
3-5	8
4-6	2
5-6	0
5-9	3
6-7	8
7-8	0
7-9	0
8-10	10
9-10	5

7) Draw the network and identify the critical path.

Activity	Duration
1-2	7
1-3	7
2-3	8
2-4	6
3-6	9
4-5	3
5-6	5

8) Find the probability of completing the below project within 34 days

Activity	To	Tm	Tp
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	1	6	15

9) Apply project crashing for the below project and calculate the cost of the project

Activity	Time		Cost	
	Normal	Crash	Normal	Crash
1-2	8	4	3000	6000
1-3	5	3	4000	8000
2-4	9	6	4000	5500
3-5	7	5	2000	3200
2-5	5	1	8000	12000
4-6	3	2	10000	11200
5-6	6	2	4000	6800
6-7	10	7	6000	8700
5-7	9	5	4200	9000

10) Write short notes on
   a) Steps in PERT
   b) Cost slope
   c) Project crashing

UNIT – V

1) The cost of the machine is Rs 6100/- and its scrap value is Rs 100 at the end of every year, The Maintenance cost found from experience are as follows:

Year	1	2	3	4	5	6	7	8
M.C	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

2) Define replacement models? Explain the replacement model types in detail

3) Discuss Johnsons rule in sequencing jobs

4) Define job sequencing and explain its methods of solution

5) There are nine jobs, each of which must go through two machines P and Q in the order PQ, the processing times (in hours) are given below:

Machine	Job(s)								
	A	B	C	D	E	F	G	H	I
P	2	5	4	9	6	8	7	5	4
Q	6	8	7	4	3	9	3	8	11

Find the sequence that minimizes the total elapsed time T. Also calculate the total idle time for the machines in this period.

6) Find the sequence of jobs and elapsed time, idle times of 1 and 2 machines.

Job	1	2	3	4	5	6
Machine-1	5	9	4	7	8	6
Machine-2	7	4	8	3	9	5

7) Find the sequence of jobs and elapsed time, idle times of 1 and 2 machines.

Job	1	2	3	4	5
Machine-1	10	2	18	6	20
Machine-2	4	12	14	16	8

8) There are five jobs (namely 1,2,3,4 and 5), each of which must go through machines A, B and C in the order ABC. Processing Time (in hours) are given below:

Jobs	1	2	3	4	5
Machine A	5	7	6	9	5
Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

Find the sequence of the jobs and elapsed time.

9) A fleet owner finds from his past experience records that the cost of the machine is Rs 6000/- and the running cost are given below. At what age the replacement is due;-

Year	1	2	3	4	5	6	7	8
Maintenance Cost	1000	1200	1400	1800	2300	2800	3400	4000
Resale Value	3000	1500	750	375	200	200	200	200

10) A) Why should manufacturers go for replacement?
B) What is Group replacement?