SIDDHARTH INSTITUTE OF ENGINEERING & TECHONOLOGY: PUTTUR

Department of MBA- II Semester

SUB: **OPERATIONS RESEARCH FOR MANAGERS** (16MB708)

Important questions

UNIT-1

1. What is operations research and explain briefly its applications in industrial organizations?
2. What are the characteristics of operations research? Discuss.
3. Discuss the importance of OR in decision-making process.
4. Enumerate, with brief description, some of the important techniques used in OR.
5. Discuss the limitations of operation research.
6. Describe the various steps involved in OR study.
7. Discuss significance and scope of operation research.
8. Describe briefly the different phases of operation research.
9. Explain steps involved in the solution of OR problems.
10. Illustrate the importance of features in OR.

UNIT-2

1. 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?
2. A Company has three operational departments (Weaving, Processing and packing) with capacity to produce three different types of cloths namely suiting, shirting and woolens yielding the profit of Rs 2, Rs 4 and Rs.3 per meter respectively. One meter suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing 1 meter of shirting requires 4 minutes in weaving. 1 minute in processing and 3 minutes in packing while one meter woolen requires 3 minutes in each department. In a week, total run time of each department is 60,40 and 80 hours of weaving, processing and packing departments respectively. Formulate the linear programming problem to find the product mix to maximize the profit.

	Product			Total availability (minutes)
	Suiting	Shirting	Woolen	
Weaving dept.	3	4	3	60x60
Processing dept.	2	1	3	40x60
Packing. Dept.	1	3	3	80x60

3. Solve the following LP problems by graphical method.

   Min. $Z = 20x_1+10x_2$

S/t

$x_1+2x_2 \leq 40$

$3x_1+x_2 \geq 30$

$4x_1+3x_2 \geq 60$

4. Solve the following LP problems by graphical method.

Min. $Z = 45x_1+80x_2$

S/t

$5x_1+20x_2 \leq 400$

$10x_1+15x_2 \geq 450$

5. Solve the following problem by Simplex method.

Max. $Z = 8x_1+19x_2+7x_3$

S/t

$3x_1+4x_2+x_3 \leq 25$

$x_1+3x_2+3x_3 \geq 50$

6. 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	

7. 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	

8. Find Initial basic feasible solution for the below problem and test the optimiality

	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	

9. What is Dengeneracy in transportation and unbalanced transportation problem?
10. Find Assignement cost for the below problem through HAM 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

UNIT-3

1. Define job sequencing and explain its methods of solution.
2. 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

3. Find the sequence that minimizes the total elapsed time T. Also calculate the total idle time for the machines in this period.
4. . 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

5. 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

6. 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

7. Find total elapsed time and ideal times for Job-1 and Job-2 for the below problems.

Job-1	Sequence	A	B	C	D	E
	time	3	4	2	6	2
Job-2	sequence	B	C	A	D	E
	time	5	4	3	2	6

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

$$\begin{pmatrix} 1 & 3 & 6 \\ 2 & 1 & 3 \\ 6 & 2 & 1 \end{pmatrix}$$

9. Use Dominance rule to determine the value of the game and optimal strategies for both players.

	I	II	III
I	-4	6	3
II	-3	-3	4
III	2	-3	4

10. Use Graphical method to determine the value of the game and optimal strategies for both players.

	I	II	III
I	3	-3	4
II	-1	1	-3

UNIT-4

1. What is waiting line theory? explain its service decislines
2. explain about characteristics of waiting line theory
3. A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 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 the length of the system?
   - What is the length of queue?
   - What is the waiting time of the queue?
   - What is the waiting time of the system?
4. Telephone users arrive at a booth following a poisson distribution with an average time of 5 minutes between one arrival and the next. The time taken for a telephone call is on an average 3 minutes and it follows an exponential distribution.
   - What is the probability that the booth is busy?
   - What is the length of the system?
   - What is the length of queue?
   - What is the waiting time of the queue?
   - What is the waiting time of the system?

5. A road transport company has one reservation clerk on duty at a time. She handles information of bus schedules and makes reservations. Customer arrive at a rate of 8 per hour and the clerk can service 12 customers on an average per hour.

    - What is the length of the system?
    - What is the length of queue?
    - What is the waiting time of the queue?
    - What is the waiting time of the system?

6. A company distributes its products by trucks loaded at its only loading station. Both company's trucks and contractor's trucks, are used for this purpose. It was founded out that on an average every five minutes, one truck arrived and the average loading time was three minutes.
   What is the length of the system?
   What is the length of queue?
   What is the waiting time of the queue?
   What is the waiting time of the system?
7. A warehouse has only one loading dock manned by at three person crew. Trucks arrive at the loading dock at an average rate of 4 trucks er hour and the arrival rate is poisson distributed. The loading of a truck is Rs. 20 per hour and the members of the loading crew are paid @ Rs. 6 each per hour.
   What is the length of the system?
   What is the length of queue?
   What is the waiting time of the queue?
   What is the waiting time of the system?
8. A tax consulting firm has four service stations in its office to receive people who have problems and complaints about their income, wealth and sales taxes. Arrival average 100 persons in a10 hour service day. Each tax adviser spends an irregular amount of time servicing that arrivals which have been found to have an exponential distribution. The average service time is 20 minutes.
   What is the length of the system?
   What is the length of queue?
   What is the waiting time of the queue?
   What is the waiting time of the system?
9. A ticket issuing office is being manned by a single server. Customers arrive to purchase tickets according to a poisson process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find
   What is the length of the system?
   What is the length of queue?
   What is the waiting time of the queue?
   What is the waiting time of the system?

10. Weavers in a textile mill arrive at a department store room to obtain spare parts needed for keeping the looms running. The store is manned by one attendant. The average arrival rate of weavers per hour is 10 and service rate per hour is 12.
    What is the length of the system?
    What is the length of queue?
    What is the waiting time of the queue?
    What is the waiting time of the system?

UNIT-5

1. What is a project? explain rules for drawing a network
2. 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

3. 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

4. Draw the network and identify the critical path.

Activity	Preceded by	Duration
A	-	6

B	-	8
C	A	7
D	B	12
E	C	8
F	B	7
G	D,E	5
H	F	8

5. 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

6. 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

7. Explain the replacement model types in details and define it.
8. The cost of the machine is Rs 6100/- and its scrap value is Rs 100 at the end of every year. The M.C. 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?

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	1000	1200	1400	1800	2300	2800	3400	4000

Cost								
Resale Value	3000	1500	750	375	200	200	200	200

10. A Fleet owner finds from this past experience that the cost/year of running the truck whose purchase price rises to Rs 60000/- are given below Solutions; given C= 60000/-

Year	1	2	3	4	5	6	7	8
Maintenance	10000	12000	14000	18000	23000	28000	34000	40000
Depreciation	30000	45000	52500	56250	58000	58000	58000	58000