D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1.

III B.Sc. Mathematics

Operations Research II

Question Bank

Unit I Section A

1. Define two person zero sum game.
2. Define pure and mixed strategies.
3. Define saddle point.
4. Find saddle point of

	Player B			
Player A		B1	B2	B3
	A1	1	3	1
	A2	0	-4	-3
	A3	1	5	-1

5. Explain dominance properties.

Section B

1. Solve the 2x2 game.

	Player B		
Player A		B1	B2
	A1	5	1
	A2	3	4

2. Solve

	B		
		H	T
A	H	2	-1
	T	-1	0

3. Solve the game

	B			
		B1	B2	B3
A	A1	2	5	6
	A2	7	3	4

Section C

1. Solve the game using dominance property

	Player B			
Player A		B1	B2	B3
	A1	1	7	2
	A2	6	2	7
	A3	6	1	6

2. Using graphical method

	Player B					
Player A		B1	B2	B3	B4	B5
	A1	2	-1	5	-2	6
	A2	-2	4	-3	1	0

3. Using graphical method , solve the game

	Player B		
Player A		B1	B2
	A1	1	-3
	A2	3	5
	A3	-1	6
	A4	4	1
	A5	2	2
	A6	-5	0

4. Solve graphically

	Player B				
Player A		B1	B2	B3	B4
	A1	3	3	4	0
	A2	5	4	3	7

5. Solve the game

	A	B	C	D
1	18	4	6	4
2	6	2	13	7
3	11	5	17	3
4	7	6	12	2

Unit II Section A

1. Define Integer linear programming problem.
2. What are the uses I.P.P.
3. Explain Gomary's Constraints.

Section B

1. Explain all I.P.P. Algorithm.

Section C

1. Solve the I.P.P.

   Max $Z=2x_1+3x_2$

   S.t $6x_1+5x_2\leq 25$, $x_1+3x_2\leq 10$, $x_1\geq 0$, $x_2\geq 0$ and integers.

2. Max $Z=2x_1+2x_2$

   S.t $5x_1+3x_2\leq 8$, $x_1+2x_2\leq 4$, $x_1\geq 0$, $x_2\geq 0$ and integers.

Unit III Section A

1. Define a queue.
2. What are the basic characteristics of a queue?
3. State Little's Formula.
4. Explain the various (three) states in a queuing system.
5. What are the postulates of Poissonprocess.
6. Explain the model (M/M/1:∞/FCFS)
7. Explain the model (M/M/1:N/FCFS)

Section B

1. In a telephone booth, arrivals are on the average of 15/hour. A Call on the average takes 3 min. If there is only one phone, find i)E(LS) ii) the proportion of time, the booth is expected to be idle.
2. In a super market, the average arrival rate of a customer is 1/3 minute following Poisson process. The average service time is 2.5 minutes following exponential distribution.
   i) What is the probability that queue size exceeds 6?
   ii) What is the expected time spent by a customer in the system?
3. A T.V repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If the arrival rate of repair sets is Poisson with an average rate of 10 per 8 hour a day. i) What is the expected idle time? ii) Find E(LS).
4. In a railway marshaling yard, goods train arrives at the rate of 30 trains per day. Both the inter-arrival time and service time follow Poisson distribution. The service time is 36 minutes. Find i) E(LQ) ii) The probability that the queue size exceeds 10.
5. In the usual relation of M/M/1, queuing system, if λ =3/hour and μ= 4/hour, find $P(X\geq5)$ where X is the number of customers in the system.

Section C

1. Discuss the model (M/M/1: (M/M/1:∞/FCFS)
2. Explain the model (M/M/1:N/FCFS)

Unit IV Section A

1. Define a sequencing problem.
2. Define Idle time and total elapsed time.
3. Explain Johnson's Algorithm.
4. Explain n jobs 2 machines problem.
5. Explain n jobs 3 machine problem.
6. Explain graphical method to solving 2 jobs m machine problem.

Section B

1. Find the sequence of 5 jobs on two machines:

Jobs	1	2	3	4	5	6
Machine M1	**8**	3	7	2	5	1
Machine M2	3	4	5	2	1	6
Machine M3	8	7	6	9	10	9

Jobs	1	2	3	4	5
Machine A	**5**	1	9	3	10
Machine B	2	6	7	8	6

2. Find the sequence of 7 jobs on two machines:

Jobs	1	2	3	4	5	6	7
Machine M1	**3**	12	15	6	10	11	9
Machine M2	8	10	10	6	12	1	3

3. Find the sequence of 5 jobs on 3 machines:

Jobs	1	2	3	4	5
Machine A	**3**	8	7	5	2
Machine B	3	4	2	1	5
Machine C	5	8	10	7	6

4. Find the sequence of 6 jobs on 3 machines:

Section C

1. Find the sequence of 7 jobs on 3 machines. Also find the minimum total elapsed time T and the idle time for each machine in hours.

Jobs	1	2	3	4	5	6	7
Machine M1	**3**	8	7	4	9	8	7
Machine M2	4	3	2	5	1	4	3
Machine M3	6	7	5	11	5	6	12

2. Use graphical method to find the minimum elapsed time needed to proceed 2 jobs on 4 machines A,B,C and D.

Job 1	**sequence**	A	B	C	D
	Time in hrs	2	3	5	2
Job 2	**Sequence**	D	C	A	B
	Time in hrs	6	2	3	1

Unit V Section A

1. Explain PERT and CPM.
2. What are the three phases of any project?
3. Define a Project and Network.
4. Explain: Looping and Dangling.
5. What are parallel Activities?
6. What is dummy activity?
7. What are the three time estimates in PERT?
8. Define Total float, Free float and Independent float.
9. Explain any two differences between CPM and PERT.
10. Write the values of t_e and S.D σ in PERT.
11. Define Critical path in a Network.

Section B

1. Given the data, draw the Network.

Activity	1-2	1-3	1-4	2-5	3-5	2-6	5-6	4-6
Time in weeks	4	2	10	12	6	12	9	8

2. What are the steps to draw critical path in a Network.
3. Find the expected task time t_e in the following PERT Network.

Activity	t_o	t_m	t_p
1-2	5	6	7
1-3	1	1	7
1-4	2	4	12
2-5	3	6	15
3-5	1	1	1
4-6	2	2	8
5-6	1	4	7

Section C

1. Given the Data :

Activity	1-2 1-3 2-4 3-4 3-5 4-5 4-6 5-6
Duration(days)	6 5 10 3 4 6 2 9

i) Draw the Network.

ii) Find the Critical Path.

iii) The total duration.

2. Given the Data

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
t_o	3	2	6	2	5	3	3	1	4
t_m	6	5	12	5	11	6	9	4	19
t_p	15	14	30	8	17	15	27	7	28

i) Draw the Network.

ii) Find the Critical Path.

iii) Find the duration of the project.

iv) Find the Variance of each activity.