

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2023
(Second Semester)

Branch – COMPUTER SCIENCE

RESOURCE MANAGEMENT TECHNIQUES

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 1 = 5)

- 1 In a LPP, Minimize $Z =$
 - (i) $-\text{maximize}(Z)$
 - (ii) $\text{maximize}(-Z)$
 - (iii) $-\text{maximize}(-Z)$
 - (iv) $\text{maximize}(Z)$
- 2 The occurrence of degeneracy while solving a transportation problem means that
 - (i) Total supply equals total demand
 - (ii) The solution so obtained is not feasible
 - (iii) Total supply not equals total demand
 - (iv) The solution so obtained is feasible
- 3 Mean and average number of arrivals per unit time\period is called
 - (i) Mean service rate
 - (ii) Mean arrival rate
 - (iii) interarrival time
 - (iv) Poisson time
- 4 A dummy activity is
 - (i) Does consume time and resources
 - (ii) Represented by line
 - (iii) the value is zero
 - (iv) the value is One
- 5 Every game theory model have
 - (i) saddle point
 - (ii) payoff
 - (iii) probabilities
 - (iv) strategies

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

- 6 a Solve the Linear programming problem using the graphical method

$$\text{Maximize } z = 4x_1 + 10x_2$$

Subject to the Constraints

$$2x_1 + 2x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$\text{and } x_1, x_2 \geq 0$$

OR

- b Solve the Linear programming problem using the Simplex method

$$\text{Maximize } z = 3x_1 + 2x_2$$

Subject to the Constraints

$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$\text{and } x_1, x_2 \geq 0$$

- 7 a Find the initial basic solution by using the Northwest Corner Rule

Warehouses	Market				Capacity
	M1	M2	M3	M4	
W1	2	3	11	7	6
W2	1	0	6	1	1
W3	5	8	15	9	10
Demand	7	5	3	2	

OR

- b Explain the balanced and unbalanced assignment problem with an example.

Cont...

- 8 a Customer arrives at one person barber shop according to a Poisson process with a mean inter-arrival time of 20 minutes. Customers spend an average of 15 minutes in the barber chair. (i) What is the probability that a new arrival need not wait for the barber to be free? (ii) How much time can customers expect to spend in the shop.

OR

- b Discuss the various elements and characteristics of queueing system.

- 9 a Draw the network diagram for the following data

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor activity	--	A	B	B	B	C	C	F, G	D, E, H	I

OR

- b Outline the limitations of simulation.

- 10 a Compare Ordering Cost and Carrying Cost.

OR

- b In a game of matching coins with 2 players, A wins 1 unit value when there are 2 heads, wins nothing when there are 2 tails, and loses $\frac{1}{2}$ unit value when there are one head and one tail. Develop Pay Off matrix and value of the game.

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 6 = 30)

- 11 a Use Big M Method to solve the LPP

$$\text{Maximize } z = 2x_1 + x_2 + x_3$$

Subject to the Constraints

$$4x_1 + 6x_2 + 3x_3 \leq 8$$

$$3x_1 - 6x_2 - 4x_3 \leq 1$$

$$2x_1 + 3x_2 - 5x_3 \geq 4$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

OR

- b Explain the Computation procedure for Solving an LPP using the Two-Phase method.

- 12 a Solve the following transportation problem to maximize profit

Sources	Profit (Rs)				Capacity
	A	B	C	D	
S1	40	25	22	33	100
S2	44	35	30	30	30
S3	38	38	28	30	70
Demand	40	20	60	30	

OR

- b A batch of 4 jobs can be assigned to 5 different machines. The set-up time (in hours) for each job on various machines is given below

Jobs	Machines				
	M1	M2	M3	M4	M5
J1	10	11	4	2	8
J2	7	11	10	14	12
J3	5	6	9	12	14
J4	13	15	11	10	7

Find an optimal assignment of jobs to machines that will minimize the total setup time.

- 13 a On average 96 patients per (24 hour) day require the service of an emergency clinic. Also, an average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs.100 per patient treated to obtain an average service time of 10 minutes and that each minute of decrease in this average time would cost Rs .10 per patient treated. Analyze how much would have to be budgeted by the clinic to decrease the average size of the queue from 1 $\frac{1}{3}$ patients to $\frac{1}{2}$ patients.

OR

Cont...

- 13- b A petrol pump station has 4 pumps. The service times follow the exponential distribution with a mean of 6 min and cars arrive for service in a Poisson process at the rate of 30 cars per hour. Evaluate the following (a) What is the probability that arrival would have to wait in line? (b) Find the average waiting time, average time spent in the system, and the average number of cars in the system (c) For what percentage of time would a pump be idle on average?

- 14 a The following table lists the jobs of a network along with their time estimates

Jobs		Duration (days)		
i	j	Optimistic	Most likely	Pessimistic
1	2	3	6	15
1	6	2	5	14
2	3	6	12	30
2	4	2	5	8
3	5	5	11	17
4	5	3	6	15
6	7	3	9	27
5	8	1	4	7
7	8	4	19	28

Construct the PERT network and find (i) a Critical path and (ii) the probability of completing the project in 30 weeks.

OR

- b A small project consists of seven activities for which the relevant data are given below.

Activity	A	B	C	D	E	F	G
Predecessor activity	--	--	--	A, B	A, B	C, D, E	C, D, E
Duration time	4	7	6	5	7	6	5

Draw the network diagram and find the project completion time.

- 15 a Consider the Pay Off Matrix of player A as shown in the table below and solve it optimally using the graphical method.

		Player B				
		1	2	3	4	5
Player A	1	3	6	8	4	4
	2	-7	4	2	10	2

OR

- b A contractor has to supply 10000 bearings per day to an automobile manufacturer. He finds that when he starts a production run, he can produce 25000 bearings per day. The cost of holding a bearing in stock for one year is 2 paise and the set-up cost of the production run is Rs.18. How frequently should the production run be made and which is the Best Economic Batch Quantity? How much would the Number of Setup and Total Inventory Cost.

Z-Z-Z

END