20CMP14

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2022
(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 The two forms of LPP are____.
(i) Matrix form and standard form (ii) Standard form and general form
(iii) Matrix form and canonical form (iv) Standard form and canonical form

2 Which of the following methods is used to verify the optimality of the current solution of the transportation problem?
(i) North west corner rule (ii) Least cost method
(iii)Vogel's approximation method (iv) MODI method

3 In Kendal's notation $(a/b/c):(d/e)$, then 'c' stands for
(i) Probability law for arrival (ii) Number of channels
(iii) Capacity of the system (iv) Queue discipline

4 A simulation models uses the mathematical expressions and logical relationships of the_____.
(i) Real system (ii) Computer model
(iii) Performance measures (iv) Estimated inferences

5 A two person game without a saddle point can be converted in to a
(i) Integer programming (ii) Linear programming
(iii) Goal programming (iv) Non Linear programming

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Solve graphically the following LPP
Minimize $z = 20x_1 + 40x_2$
Subject to the constraints:
$36x_1 + 6x_2 \geq 108;\ 3x_1 + 12x_2 \geq 36;\ 20x_1 + 10x_2 \geq 100;$ Where $x_1, x_2 \geq 0$

OR

b Write the procedure for solving LPP using dual simplex method.

7 a Determine an initial basic feasible solution to the following transportation problem using North – West Corner rule

		To				
		11	13	17	14	250
		16	18	14	10	300
From		21	24	13	10	400
		200	225	275	250	
		Demand				

Available

OR

b Write the mathematical formulation of the assignment problem.

Cont...

8 a Explain the mechanism of a queueing process.

OR

b A super market has a single cashier. During peak hours, customers arrive at a rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour. Calculate:
i) The probability that the cashier is idle,
ii) The average number of customers in the queuing system,
iii) The average time a customer spends in the system,
iv) The average number of customers in the queue, and
v) The average time a customer spends in the queue waiting for service

9 a Explain the rules of network construction.

OR

b Bright bakery keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given here:

Daily demand:	0	10	20	30	40	50
Probability:	0.01	0.20	0.15	0.50	0.12	0.02

Consider the following sequence of random numbers:

48, 78, 19, 51, 56, 77, 15, 14, 68, 09

Using this sequence, simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 30 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

10 a Solve the game using dominance property.

	Player B		
Player A	10	5	-2
	13	12	15
	16	14	10

OR

b A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is Rs.2 and the set-up cost of a production run is Rs.1,800. How frequently should production run be made?

SECTION -C (30 Marks)

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

11 a Use Big- M method to find the optimum solution for the following L.P.P.
Maximize $Z = 6x_1 + 4x_2$ Subject to the constraints:
$2x_1 + 3x_2 \leq 30,\ 3x_1 + 2x_2 \leq 24,\ x_1 + x_2 \geq 3,$ and $x_1, x_2 \geq 0$

OR

b Use Two-phase simplex method to Maximize $Z = 5x_1 + 3x_2$
Subject to the constraints: $2x_1 + x_2 \leq 1,\ x_1 + 4x_2 \geq 6,$ and $x_1, x_2 \geq 0$

12 a Find the optimal solution to the following transportation problem:

		To				Supply
		D_1	D_2	D_3	D_4	
From	O_1	23	27	16	18	30
	O_2	12	17	20	51	40
	O_3	22	28	12	32	53
	Demand	22	35	25	41	

OR

b Solve the following assignment problem and find the minimum cost.

Persons	Jobs			
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

13 a A supermarket has two girls serving at the counters. The customers arrive in a Poisson fashion at the rate of 12 per hour. The service time for each customer is exponential with mean 6 minutes. Find (i) the probability an arriving customer has to wait for service, (ii) the average number of customers in the system, and (iii) the average time spend by a customer in the super-market.

OR

b A car servicing station has 3 stalls where service can be offered simultaneously. The cars wait in such a way that when a stall becomes vacant, the car at the head of the line pulls up to it. The station can accommodate at most four cars waiting (seven in the station) at one time. The arrival pattern is Poisson with a mean of one car per minute during the peak hours. The service time is exponential with mean 6 minutes. Find the average number of cars in the service station during peak hours, the average waiting time and the average number of cars per hour that cannot enter the station because of full capacity.

14a A project schedule has the following characteristics:

	1-2	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
Optimistic time (t_o)	1	1	1	3	2	3	4	6	2	4	1	3
Most likely time (t_m)	2	2	3	4	3	5	5	7	4	6	2	5
Pessimistic time (t_p)	3	3	5	5	4	7	6	8	6	8	3	7

Construct a PERT network and find out:

(i) the earliest possible time (T_E) to complete the different stages of the project.
(ii) the latest allowable time (T_L) for them.
(iii) the slack values
(iv) the critical paths
(v) the probability factor for completing the project in 30 weeks.

OR

b Customer arrive at a milk booth for the required service. Assume that inter-arrival and service times are constant and given by 1.8 and 4 time units, respectively. Simulate the system by hand computations for 14 time units. What is the average waiting time per customer? What is the percentage idle time of the facility? [Assume that the system starts at $t = 0$.]

15a Obtain the optimal strategies for both-persons and the value of the for zero-sum game whose payoff matrix is as follows:

	Player B	
Player A	1	-3
	3	5
	-1	6
	4	1
	2	2
	-5	0

OR

b The demand for a purchased item is 1,000 units/month, and shortages are allowed. If the unit cost is Rs.1.50 per unit, the cost of making one purchase is Rs.600, the holding cost for one unit is Rs.2 per year, and the cost of one shortage is Rs.10 per year, determine:
(i) the optimum purchase quantity
(ii) the number of orders per year
(iii)the optimum total yearly cost.

Z-Z-Z END