University of Mumbai

Examination Second Half 2022 under cluster (Lead College:)

Examinations Commencing from 25th July 2022 to 3rd August 2022

Program: **MCA**

Curriculum Scheme: 2 YR

Examination: M.C.A Semester II

Course Code: MCA21 and Course Name: Mathematical Foundation for Computer Science 2

Time: 2-hour 30 minutes Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.
1.	Objective function of an LP problem is
Option A:	A constant
Option B:	A function to be optimized
Option C:	An inequality
Option D:	A quadratic equation
2.	Customers arrive at a reception counter at an average interval rate of 10 minutes. The receptionist takes an average of 6 minutes for one customer. Determine the average queue length.
Option A:	9/10
Option B:	7/10
Option C:	11/10
Option D:	3/10
3.	For finding an initial feasible solution in transportation problem _____ method is used
Option A:	Simplex
Option B:	Big-M
Option C:	Least Cost Method
Option D:	Hungarian
4.	Monte Carlo simulation gets its name from which of the following?
Option A:	Data collection
Option B:	Model formulation
Option C:	Analysis
Option D:	Random number assignment
5.	Dummy row or column is added in an assignment problem
Option A:	To increase the profit function
Option B:	To balance total activities and total resources
Option C:	To prevent a solution from becoming degenerate
Option D:	To reduce the total cost of assignment
6.	A person who leaves the queue by losing his patience to wait is said to be
Option A:	Jockeying
Option B:	Balking
Option C:	Reneging
Option D:	Collusion

7.	A feasible solution to an LP problem,
Option A:	Must satisfy all of the problem's constraints simultaneously.
Option B:	Need not satisfy all of the constraints, only some of them
Option C:	Must be a corner point of the feasible region
Option D:	Must optimize the value of the objective function
8.	What is the value of the following game?

	B1	B2	B3	B4
A1	20	15	12	35
A2	25	14	8	10
A3	40	2	10	5
A4	-5	4	11	0

Option A:	20
Option B:	-5
Option C:	12
Option D:	0
9.	The solution to a transportation problem with 'm' supplies & 'n' destinations is basic feasible if number of positive allocations are
Option A:	m+n
Option B:	m+n+1
Option C:	m*n
Option D:	m+n-1
10.	Feasible region formed by the constraints $x+4y \leq 4$, $3x+3y \geq 18$, $x \geq 0$ and $y \geq 0$ is:
Option A:	bounded
Option B:	unbounded
Option C:	lies first and second quadrant
Option D:	does not exist

Q2.
(20 Marks Each)

Solve any two questions out of three **10 marks each**

A

Two manufacturing firms A and B are competing for an increased market share. These are their strategies:
A1,B1 – Give coupons
A2,B2 – Decrease Price
A3,B3 – Increase Advertisement
A4,B4 – Maintain Present Strategy

Pay-off matrix below shows the increase in market share for Firm A. Find the optimum strategies for A and B and the value of the game.

		Firm B			
		B1	B2	B3	B4
Firm A	A1	35	65	25	5
	A2	30	20	15	0
	A3	40	50	0	10
	A4	55	60	10	15

B

A television company operates two assembly lines Line1 and Line2. Each line is used to assemble components of three types of televisions – LCD, LED and QLED. The expected daily production on each line is as follows:

TV Model	Line	
	Line1	Line2
LCD	3	1
LED	1	1
QLED	2	6

The daily running cost for 2 lines is Rs.6000 for Line1 and Rs.4000 for Line2. It is given that the company must manufacture at least 24 LCD, 16 LED and 48 QLED TV sets for an order. Formulate this problem as an LPP taking the objective function as minimization of cost. Also determine the number of days that the 2 lines should be run to meet the requirements.

C

At a booking window, customers arrive at the rate of 10 per minute approximated to Poisson's distribution. If service time is exponentially distributed with a mean of 15 per minute, determine:

a) Probability that the booking clerk waits for the customer
b) Probability that there are at least 3 customers in the queue
c) Average number of customers in the system
d) Average time spent in the queue

Q3. (20 Marks Each)

Solve any two questions out of three **10 marks each**

A

A cement factory manager is considering the best way to transport cement from 3 manufacturing centres P,Q and R to depots A,B,C,D,E.

The transportation cost per ton are given below. The availability at the centres P,Q,R are 60,35 and 40 respectively. The demand at the depots are 22, 45, 20, 18 and 30 respectively. Find the optimum distribution schedule.

		Depot				
		A	B	C	D	E
Manufacturing Centres	P	4	1	3	4	4
	Q	2	3	2	2	3
	R	3	5	2	4	4

B

Solve the following LPP using Big-M Method

Minimize $Z = 12x_1 + 20x_2$

subject to

$$6x_1 + 8x_2 \geq 100$$

$$7x_1 + 12x_2 \geq 120$$

and

$$x_1, x_2 \geq 0$$

C

The owner of a bakery shop has observed the following demand pattern for a particular brand of cakes.

Daily Demand	0	10	20	30	40	50
Probability	0.02	0.08	0.15	0.40	0.30	0.05

Every morning he receives fresh cakes and places an order for the next day. The order quantity for next day is equal to the number of cakes he demanded the previous day. Assuming that he receives 30 cakes on the first day and places an order for 30 cakes for the next day, simulate the system for the next 10 days to determine:

a) Average number of cakes sold per day

b) Probability of stock out on any day

c) Average number of unsold cakes per day if he does not sell stale cakes

d) Average profit per day if he earns a profit of Rs.20 per cake and returns unsold cakes the next day with a loss of Rs.10

Random Numbers: 3244, 8857, 9516, 8058, 6047, 9504, 4554, 3172, 8699, 3584

Q4. (20 Marks Each)

Solve any two questions out of three **10 marks each**

A

A transport company has 5 buses and 5 routes. There are certain technical restrictions which do not allow certain buses to ply on certain routes as shown in the table below. The cost of assigning buses to routes is shown in the matrix below. Determine the optimal assignment of buses to routes.

		Routes				
		R1	R2	R3	R4	R5
Buses	B1	80	40	-	70	40
	B2	-	80	60	40	40
	B3	70	-	60	80	70
	B4	70	80	30	50	-
	B5	40	40	50	-	80

B

Solve the following LPP using Simplex Method

	Maximize $Z = 7x_1 + 5x_2$ subject to $x_1 + 2x_2 \leq 6$ $x_1 + 3x_2 \leq 12$ and $x_1, x_2 \geq 0$
C	The research department of XYZ Company has recommended to the marketing department to launch a shampoo of three different types. The marketing manager has to select one of the types depending on the following estimated payoffs for various levels of sales. What will be the marketing manager's decision if (a) Maximax (b) Maximin (c) Minimax (d) Regret and (e) Laplace criterion is applied

Type of Shampoo	Estimated Level of Sales		
	15000	10000	5000
Tulsi	30	10	10
Amla	40	15	5
Green Apple	55	20	3