3/12/2024   MCA   SEM-II   C SCHEME   MFCS-II   QP CODE: 10067198

Duration: 3 Hours   **Total Marks: 80**

N.B: (1) Question 1 is **compulsory.**

(2) Attempt any **Three questions** out of remaining **Five questions.**

(3) Assume any **necessary data**, if required, but **justify the same.**

(4) **Figures** to the **right** indicate **full marks** for that question.

(5) Use of Scientific **calculator** is **allowed.**

Q.1 A) Solve the following LPP using graphical method   **[10]**

Minimize $Z = 3x_1 + 2x_2$

Subject to

$$7x_1 + 2x_2 \geq 30$$
$$5x_1 + 4x_2 \geq 20$$
$$2x_1 + 8x_2 \geq 16$$

And

$$x_1, x_2 \geq 0$$

B) Two firms are competing for business with Firm A's payoff matrix as given   **[10]**
below. Find the optimal strategies for Firm A and B and the value of the
game.

		Firm B		
		B1	B2	B3
Firm A	A1	10	5	-2
	A2	13	12	15
	A3	16	14	10

Q.2 A) Solve the following LPP   **[10]**

Maximize $Z = 3x_1 + 4x_2$

Subject to

$$2x_1 + x_2 \leq 6$$
$$2x_1 + 3x_2 \leq 9$$

And

$$x_1, x_2 \geq 0$$

B) Five machines are to be assigned to 5 jobs. The cost of assigning each   **[10]**
machine to each job in Rs. is given in the following matrix. Find which
machine is to be assigned to which job so as to minimize the total cost of
assignment.

		Jobs				
		J1	J2	J3	J4	J5
	M1	11	17	8	16	20
	M2	9	7	12	6	15
Machines	M3	13	16	15	12	16
	M4	21	24	17	28	26
	M5	14	10	12	11	15

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Q.3 **A)** The owner of a bakery shop has observed the following demand pattern for **[10]** a particular brand of cakes.

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

Sequence of random numbers: 3244, 8857, 9516, 8058, 6047, 9504, 4554, 3172, 8699, 3584. Assuming that he receives 30 cakes every day, simulate the system for the next 10 days to determine average number of cakes sold per day

B) For a manufacturing company with the following alternatives and states of **[10]** nature, identify the decisions made under the following criteria
   i.   Maximax
   ii. Maximin
   iii. Hurwicz Realism (with $\alpha = 0.8$)
   iv. Laplace Equal Likelihood.

Alternatives	States of Nature (Product Demand)			
	High	Moderate	Low	Nil
Expand	50,000	25,000	-25,000	-45,000
Construct	70,000	30,000	-40,000	-80,000
Subcontract	30,000	15,000	-1,000	-10,000

Q.4 **A)** A service store employs one cashier at its counter. 8 customers arrive on an **[10]** average every 5 minutes; while the cashier can serve 10 customers in the same time. Assuming Poisson distribution for arrival and exponential distribution for service rate, find
   a) Average number of customers in the system
   b) Average number of customers in the queue
   c) Probability that there is no customer at the counter
   d) Average time a customer spends in the system

B) Solve the following LPP using 2-Phase method **[10]**
Maximize $Z = 3x_1 - x_2$
Subject to

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

And

$$x_1, x_2 \geq 0$$

Q.5 **A)** Find the Initial Basic Feasible Solution for the following transportation **[10]**
problem using the following methods
(i)   North-West Corner Rule (NWCR)
(ii)   Least Cost Method

		Warehouse				
		W1	W2	W3	W4	Capacity
Factory	F1	19	30	50	10	7
	F2	70	30	40	60	9
	F3	40	8	70	20	18
Requirement		5	8	7	14	

B) Write a short note on the **[10]**
i)   Steps in Simulation
ii)   Applications of Simulation

Q.6 **A)** Solve the following LPP using Big-M **[10]**
Maximize $Z = 3x1 - x2$
Subject to

$$2x1 + x2 \leq 2$$
$$x1 + 3x2 \geq 3$$
$$x2 \leq 4$$

And

$$x1, x2 \geq 0$$

B) Find optimum solution for the following transportation problem by using **[10]**
MODI method.

	D1	D2	D3	D4	Supply
S1	6	8	8	5	30
S2	5	11	9	7	40
S3	8	9	7	13	50
Demand	35	28	32	25	