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Total No. of Questions : 13] **[Total No. of Pages :04**

Paper ID [A0515]

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MCA (305) (S05) (O) (Sem. - 3rd)

COMPUTER BASED OPTIMISATION METHODS

Time : 03 Hours **Maximum Marks : 75**

Instruction to Candidates:

1) Section - A is **Compulsory**.

2) Attempt any **Nine** questions from Section - B.

Section - A

Q1) ***(15 × 2 = 30)***

a) Define Operation research.

b) What is the role of decision making in OR?

c) What do you mean by deterministic model in OR?

d) Explain the Standard form of LPP?

e) Name four application areas of linear programming techniques.

f) Define the mathematical model for a General Transportation Model.

g) Can degeneracy occur in a transportation model? Explain.

h) Explain the infeasible assignment in context of assignment problem.

i) What is the optimality criterion in an assignment problem?

j) What is a non-degenerate basic feasible solution?

k) Explain stage in context of dynamic programming.

l) What is a backward pass in a decision tree?

m) What is an all IPP?

n) Explain the joint probability.

o) Explain the poisson's distribution.

Section - B

(9 × 5 = 45)

Q2) Using Graphical method solve the following LPP

Maximize $z = x_1 + (x_2/2)$

Subject to

$$3x_1+2x_2 \leq 12,$$
$$5x_1 \leq 10,$$
$$x_1+x_2 \leq 8,$$
$$-x_1+x_2 \geq 4,$$
$$x_1, x_2 \geq 0.$$

Q3) A city hospital has the following minimal daily requirement of nurses:

Period	Clock time (24 hrs a day)	Minimal Number of Nurses required
1	6AM to 10AM	2
2	10AM to 2PM	7
3	2PM to 6PM	15
4	6PM to 10PM	8
5	10PM to 2AM	20
6	2AM to 6AM	6

Nurses report to the hospital at the beginning of each period and work for 8 consecutive hours. The hospital wants to determine the minimal number of nurses to be employed so that there are sufficient numbers of nurses available for each period. Formulate the linear programming problem.

Q4) Solve the following problem using Simplex method.

Maximize $z = x_1+2x_2+3x_3-x_4$

Subject to

$$x_1+2x_2+3x_3 = 15,$$
$$2x_1+x_2+5x_3 = 20,$$
$$x_1+2x_2+1x_3+x_4 = 10,$$
$$x_1, x_2, x_3, x_4 \geq 0.$$

Q5) Explain the various essential characteristics of Operation Research.

Q6) Find the initial basic feasible solution of the following transportation problem by North-West corner rule.

Origin		Destination A1	B1	C1	D1	E1	Supply
	A	2	11	10	3	7	4
	B	1	4	7	2	1	8
	C	3	9	4	8	12	9
	Demand	3	3	4	5	6	

Q7) Solve the following Problem (with given initial basic feasible solution) Using Modi method.

Plants		Distribution Center 1	2	3	4	5	Supply
	A	4 (60)	3 (20)	1	2	6	80
	B	5	2 (40)	3 (20)	4	5	60
	C	3	5	6 (10)	3 (30)	2	40
	D	2	4	4	5 (10)	3(10)	20
Requirement		60	60	30	40	10	

Q8) For an assignment model, draw the flow chart for Hungarian method.

Q9) Solve the following Assignment Problem

	A	B	C	D	E
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

Q10) Use revised simplex method to solve

Maximize $z = 2x_1 + x_2$

Subject to

$3x_1 + 4x_2 \leq 6,$

$6x_1 + x_2 \leq 3,$

$x_1, x_2 \geq 0.$

Q11) A firm has divided its marketing area into three zones. The amount of sales depends upon the number of salesman in each zone. The firm has been collecting the data regarding sales and salesman in each area over a number of past years. The information is summarized in table. For the next year firm has only 9 salesmen and the problem is to allocate these salesman to three

different zones so that the total sales are Maximum.

No. of Salesman	Zone1	Zone2	Zone3
0	30	35	42
1	45	45	54
2	60	52	60
3	70	64	70
4	79	72	82
5	90	82	95
6	98	93	102
7	105	98	110
8	100	100	110
9	90	100	110

Q12) A pair of fair dice is rolled once. Let x be the random variable whose value for any outcome is the sum of the two numbers on the dice

a) Find the probability function x, construct the probability table and a probability chart.
b) Find the probability that x is an odd number.
c) Find $P(3 \leq x_i \leq 9)$ and $P(0 \leq x_i \leq 4)$

Q13) Given the following payoff function for each act a1 and a2

$Q_{a1} = -25 + 40x$

$Q_{a2} = -80 + 29x$

a) Find the breakeven value of x.
b) If $x = 5$, which is better act?
c) If $x = 5$, what is the regret of poor strategy?
d) If $x = -10$, which is better act?
e) If $x = -10$, what is the regret of poor strategy?

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