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MCA DEGREE II SEMESTER EXAMINATION, APRIL 2008

CAS 2205 COMPUTER BASED OPTIMIZATIONS

Time: 3 Hours — Maximum marks : 50

PART A

(Answer ***ALL*** questions)
(All questions carry ***EQUAL*** marks)

(15 x 2 = 30)

I. a. What do you mean by an LPP. Express it mathematically.
b. Define artificial variables.
c. Distinguish between dual and primal problem in LPP.

II. a. Write the mathematical formulation of a transportation problem.
b. Explain briefly a method of solving an assignment problem.
c. What do you mean by degeneracy in transportation problems?

III. a. Define the binary LPP.
b. Write the mathematical formulation of a travelling salesman problem.
c. Write a note on integer programming problem.

IV. a. State Bellman's principle of optimality.
b. Write a note on probabilistic dynamic programming.
c. Explain the characteristics of a dynamic programming problem.

V. a. Explain the characteristics of a queuing system.
b. Distinguish between discrete and continuous Markov chains.
c. What do you mean by Birth-Death process?

PART B

(All questions carry ***EQUAL*** marks)

(5 x 4 = 20)

VI. A. Solve by Simplex method

Maximise $Z = 4x_1 + 10x_2$ *Subject to*

$$2x_1 + x_2 \le 50$$
$$2x_1 + 5x_2 \le 100$$
$$2x_1 + 3x_2 \le 90$$
$$x_1, x_2 \ge 0$$

OR

B. Solve by dual Simplex method

Minimise $Z = 3x_1 + x_2$ *Subject to*

$$x_1 + x_2 \ge 1$$
$$2x_1 + 3x_2 \ge 2$$
$$x_1, x_2 \ge 0$$

(Turn over)

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VII. A. Solve the following transportation problem:

	A	B	C	D	Available
E	11	13	17	14	250
F	16	18	14	10	300
G	21	24	13	10	400
Demand	200	225	275	250	

OR

B. Solve the assignment problem:

	A	*B*	*C*	*D*
1	10	25	15	20
2	15	30	5	15
3	35	20	12	24
4	17	25	24	20

VIII. A. Solve by branch and bound technique:

$Maximise \ Z = 2x_1 + 3x_2 \ Subject \ to$

$$5x_1 + 7x_2 \leq 35$$

$$4x_1 + 9x_2 \leq 36$$

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

OR

B. Solve the TSP

	A_1	A_2	A_3	A_4	A_5
A_1	∞	2	5	7	1
A_2	6	∞	3	8	2
A_3	8	7	∞	4	7
A_4	12	4	6	∞	5
A_5	1	3	2	8	∞

IX. A. Use DPP to show that $Z = p_1 \log p_1 + p_2 \log p_2 + \ldots\ldots\ldots + p_n \log p_n$ subject to the constraints $p_1 + p_2 + \ldots\ldots + p_n = 1$ and $p_j \geq 0, \ \ j = 1, 2 \ldots\ldots n$ is a minimum when $p_1 = p_2 = \ldots\ldots\ldots = p_n = 1/n$.

OR

B. Use DPP to solve the LPP

$Maximise \ Z = 3x_1 + 5x_2 \ Subject \ to$

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 18$$

$$x_1, x_2 \geq 0$$

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X. A. The rate of arrivals at a public telephone booth follows Poisson distribution with an average time of 10 minutes between one customer and the next. The duration of a phone call is assumed to follow exponential distribution with mean time of 3 minutes.

(a) What is the probability that a person arriving at the both will have to wait?

(b) What is the average length of the non-empty queues that form from time to time?

OR

B. Show that for a single service station, Poisson arrivals and exponential service time, probability that exactly n calling units are in then queuing system is $(1-\rho)\,\rho^n$ when ρ is the traffic intensity.

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