MCA.I/11.14.0975 Reg. No. | | | | | | | | |

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MCA DEGREE I SEMESTER EXAMINATION NOVEMBER 2014

CAS 2105 COMPUTER BASED OPTIMIZATION

(2011 Revision - Supplementary)

Time: 3 Hours Maximum Marks: 50

PART A

(Answer *ALL* questions)

($15 \times 2 = 30$)

I. (a) Explain the terms (i) slack variable (ii) surplus variable (iii) artificial variable
(b) How do you detect infeasibility of an LPP while solving by graphical method and simplex method?
(c) Explain 'Duality' in linear programming.

II. (a) Obtain an initial basic feasible solution to the following transportation problem.

Destination

Origin		D_1	D_2	D_3	Supply
	O_1	6	8	4	14
	O_2	4	9	8	12
	O_3	1	2	6	5
	Demand	6	10	15	

(b) What is degeneracy in transportation problem? Discuss the method to resolve degeneracy in T.P.
(c) Write the mathematical formulation of assignment problem.

III. (a) Define integer programming problem and briefly explain the importance of IPP.
(b) Discuss briefly the cutting plane algorithm for solving pure integer programming problem.
(c) What is binary linear programming problem?

IV. (a) Explain briefly the characteristics of dynamic programming problem.
(b) State Bellman's principle of optimality.
(c) Differentiate deterministic and probabilistic dynamic programming problem.

V. (a) Explain the characteristics of a queuing system.
(b) Explain the terms (i) queue length (ii) queue discipline.
(c) Describe the (M/M/1) queuing system.

PART B

($5 \times 4 = 20$)

VI. Solve the following LPP by graphical method.

Maximise $Z = 2X_1 + 3X_2$

Subject to
$$X_1 + X_2 \le 30$$
$$X_2 \ge 3$$
$$X_1 - X_2 \ge 0$$
$$0 \le X_1 \le 20$$
$$0 \le X_2 \le 12$$

OR

VII. Apply the principle of duality to solve.

Minimise $Z = 2X_1 + 2X_2$

Subject to $2X_1 + 4X_2 \geq 1$

$-X_1 - 2X_2 \leq -1$

$2X_1 + X_2 \geq 1$

$X_1, X_2 \geq 0$

VIII. Solve the following transportation problem.

Destination

		D_1	D_2	D_3	D_4	Availability
Source	O_1	6	1	9	3	70
	O_2	11	5	2	8	55
	O_3	10	12	4	7	70
Demand		85	35	50	45	

OR

IX. A marketing manager has 5 salesmen and 5 sales districts. Considering the capabilities of the sales man and the nature of the districts, the marketing manager estimates that sales per month (in ` thousand) for each sales man in each district would be as follows.

Sales Districts

Sales man		A	B	C	D	E
	1	32	38	40	28	40
	2	40	24	28	21	36
	3	41	27	33	30	37
	4	22	38	41	36	36
	5	29	33	40	35	39

Find the assignment of salesman to districts that will result in maximum sales.

X. Use branch and bound method to solve the following integer programming problem.

Maximise $Z = X_1 + 4X_2$

Subject to $2X_1 + 4X_2 \leq 7$

$5X_1 + 3X_2 \leq 15$

$X_1, X_2 \geq 0$; and are integers.

OR

XI. Using Gomory's cutting plane method, solve the following mixed integer programming problem.

Maximise $Z = X_1 + X_2$

Subject to $3X_1 + 2X_2 \leq 5$

$X_2 \leq 2$

$X_1, X_2 \geq 0$; and X_1 is an integer

(Contd….3..)

XII. Use dynamic programming to solve

Minimise $Z = Y_1^2 + Y_2^2 + Y_3^2$

Subject to $Y_1 + Y_2 + Y_3 \geq 15$

$Y_1, Y_2, Y_3 \geq 0$

OR

XIII. Use dynamic programming to solve the following LPP

Maximise $Z = X_1 + 9X_2$

Subject to $2X_1 + X_2 \leq 25$

$X_2 \leq 11$

$X_1, X_2 \geq 0$

XIV. Arrivals at a telephone booth are considered to be poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean 3 minutes.

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

(ii) Find the average number of units in the system.

(iii) What is the probability that an arrival will have to wait more than 10 minutes before the phone is free.

(iv) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least 3 minutes for the phone. Bu how much should the flow of arrivals be increased in order to justify a second booth.

OR

XV. A super market has two girls at the sales counters. If the service time for each customer is exponential with mean 4 minutes and if people arrive in a poisson fashion at the rate of 10 an hour,

(i) What is the probability that an arrival will have to wait for service?

(ii) What is the expected percentage of idle time for each girl?

(iii) If a customer has to wait, what is the expected length of his waiting time?

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