Reg. No. : | | | | | | | | | | | | |

M 7941

M.C.A. DEGREE EXAMINATION, MAY/JUNE 2009.

Fourth Semester

MC 1752 — RESOURCE MANAGEMENT TECHNIQUES

(Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Old hens can be bought at Rs. 2 each and young ones at Rs. 5 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week, each egg being worth 30 paise. A hen costs Rs. 1 per week to feed. A person has only Rs. 80 to spend for hens. How many of each kind should he buy to give a profit of more than Rs. 6 per week, assuming that he cannot house more than 20 hens. Formulate this a L.P.P.

2. Define optimal solution of LPP.

3. Determine basic feasible solution to the following transportation problem using Least Cost Method.

	A	B	C	D	Supply
P	1	2	1	4	30
Q	3	3	2	1	50
R	4	2	5	9	20
Demand	20	40	30	10	

4. Write the algorithm in Assignment problem for cover all the zeros by drawing a minimum number of straight line.

5. Write the fractional cut constraint for the Gomorian pure integer cutting plane method.

6. List any four application of integer programming.

7. Draw the network for the project whose activities and their precedence relationships are given below :

Activity :	P	Q	R	S	T	U
Predecessor :	–	–	–	P, Q	P, R	Q, R

8. Write any three main managerial functions for any project.

9. Define Kendal's notation for representing queueing models.

10. In a super market, the average arrival rate of customer is 10 in every 30 minutes following Poisson process. The average time taken by the cashier to list and calculate the customer's purchases is 2.5 minutes, following exponential distribution. What is the probability that the queue length exceeds 6?

PART B — (5 × 16 = 80 marks)

11. (a) Solve the following problem by Big M simplex method.

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

Subject to

$$x_1 + 2x_2 + 3x_3 = 15$$
$$2x_1 + x_2 + 5x_3 \geq 20$$
$$x_1 + 2x_2 + x_3 + x_4 \geq 10$$

and $x_1, x_2, x_3, x_4 \geq 0$.

Or

(b) (i) Solve the following : (8)

Maximize $15x_1 + 6x_2 + 9x_3 + 2x_4$

Subject to

$$2x_1 + x_2 + 5x_3 + 6x_4 \leq 20$$
$$3x_1 + x_2 + 3x_3 + 25x_4 \leq 24$$
$$7x_1 + x_4 \leq 70$$

$x_1, x_2, x_3, x_4 \geq 0$.

(ii) Solve the following L.P.P. graphically (8)

Maximize $Z = 100x_1 + 40x_2$

Subject to

$$5x_1 + 2x_2 \leq 1000$$
$$3x_1 + 2x_2 \leq 900$$
$$x_1 + 2x_2 \leq 500$$

and $x_1, x_2 \geq 0$.

12. (a) (i) Solve the following transportation problem with unit transportation costs, demands and supplies as given below : (10)

	D1	D2	D3	D4	Supply
S1	6	1	9	3	70
S2	11	5	2	8	55
S3	10	12	4	7	70
Demand	85	35	50	45	

(ii) Write the algorithm for MODI method. (6)

Or

(b) (i) Solve the following traveling salesman problem so as to minimize the cost per cycle. (10)

	A	B	C	D	E
A	–	3	6	2	3
B	3	–	5	2	3
C	6	5	–	6	4
D	2	2	6	–	6
E	3	3	4	6	–

(ii) Write a algorithm for Hungarian method. (6)

13. (a) Use Branch and Bound technique to solve the following : (16)

Max $Z = 3x_1 + 4x_2$

Subject to constraints

$$7x_1 + 16x_2 \leq 52$$
$$3x_1 - 2x_2 \leq 18$$
$$x_1, x_2 \geq 0 \text{ and integers.}$$

Or

(b) Solve the following mixed integer programming.

Max $Z = 4x_1 + 6x_2 + 2x_3$

Subject to the constraints

$$4x_1 - 4x_2 \leq 5$$
$$-x_1 + 6x_2 \leq 5$$
$$-x_1 + x_2 + x_3 \leq 5$$

and $x_1, x_2, x_3 \geq 0$ and x_1, x_3 are integer. (16)

14. (a) A maintenance foreman has given the following estimate of times and cost of jobs in a maintenance project. (16)

Job	Predecessor	Normal Time	Normal Cost	Crash Time	Crash Cost
A	–	8	80	6	100
B	A	7	40	4	94
C	A	12	100	5	184
D	A	9	70	5	102
E	B, C, D	6	50	6	50

Overhead cost is Rs. 25 per hour. Find

(i) The normal duration of the project and the associated cost.

(ii) The minimum duration of the project and associated cost.

(iii) The least duration of the project and its cost.

(iv) If all the activities are crashed what will be the project duration and the corresponding cost.

Or

(b) Calculate the total float, free float and independent float for the project whose activities are given below :

Activity :	1–2	1–3	1–5	2–3	2–4	3–4	3–5	3–6	4–6	5–6
Key :	8	7	12	4	10	3	5	10	7	4

Find the critical path also.

15. (a) Obtain the system of steady state equations and hence find the value of p_n in usual notations where (i) $n < s$ (ii) $n \geq s$. (16)

Or

(b) (i) A bank has two tellers working on savings accounts. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawals both are exponential with mean service time 3 minutes per customer. Depositors are found to arrive in a Poisson fashion throughout the day with mean arrival rate 16 per hour. Withdrawers also arrive in a Poisson fashion with mean arrival rate 14 per hour. What would be the effect on the average waiting time for depositors and withdraws if each teller could handle both withdrawals and deposits. What would be the effect if this could be accomplished by increasing service time to 3.5 minutes? (8)

(ii) A barber shop has two barbers and three chair for customers. Assume that the customers arrive in Poisson fashion at a rate of 5 per hour and that each barber service customers according to an exponential distribution with mean of 15 minutes. Further if a customer arrives and there are no empty chairs in the shop, he will leave. What is the probability that the shop is empty? What is the expected number of customers in the shop? (8)