MCA 3rd Semester Examination, 2013

COMPUTER BASED OPTIMIZATION TECHNIQUE

PAPER—MCA-304

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP – A

[*Marks* : 50]

Answer Q. No. 1 and any two from the rest

1. Solve the following LPP using simplex method :

$$\text{Maximize} \quad Z = 2x_1 + 3x_2$$
$$\text{subject to} \quad x_1 - 5x_2 \leq 10$$
$$2x_1 - x_2 \geq 2$$
$$x_1 + x_2 \leq 10$$
$$x_1, x_2 \geq 0.$$

7

2. (a) Solve the following LPP using revised simplex method :

$$\text{Maximize} \quad Z = 2x_1 - 3x_2$$
$$\text{subject to} \quad x_1 + 2x_2 \leq 4$$
$$3x_1 + 2x_2 \leq 6$$
$$x_1, x_2 \geq 0.$$

7

(b) Solve the following Integer Programming Problem using Gomory's cutting plane method :

$$\text{Maximize} \quad Z = x_1 + 5x_2$$
$$\text{subject to} \quad 6x_1 + 8x_2 \leq 15$$
$$2x_2 \leq 3$$
$$x_1, x_2 \geq 0$$
$$x_1, x_2 \text{ are integers.}$$

7

(*Continued*)

3. (a) Determine the optimal table of the following LPP using simplex method :

$$\text{Maximize} \quad Z = x_1 + x_2$$
$$\text{subject to} \quad 2x_1 + 3x_2 \le 6$$
$$3x_1 + 2x_2 \le 6$$
$$x_1, x_2 \ge 0.$$

Using this optimal table find the optimal solution of the LPP when the requirement vector is changed from $\begin{bmatrix} 6 \\ 6 \end{bmatrix}$ to $\begin{bmatrix} 12 \\ 12 \end{bmatrix}$. 7

(b) Solve the following LPP using dual simplex method :

$$\text{Minimize} \quad Z = 15x_1 + 10x_2$$
$$\text{subject to} \quad 3x_1 + 5x_2 \ge 5$$
$$5x_1 + 2x_2 \ge 3$$
$$x_1, x_2 \ge 0.$$ 7

4. (a) Obtain the initial BFS to the following transportation problem by matrix minima method and then find out an optimal

(**4**)

solution and the corresponding cost of transportation.   7

	D_1	D_2	D_3	D_4	
O_1	4	3	5	13	15
O_2	1	8	8	5	4
O_3	5	10	6	12	8
	9	7	5	6	

(*b*) Solve the following assignment problem and determine the minimum assignment cost.

	A	B	C	D
I	11	8	8	7
II	10	9	7	8
III	10	8	7	9
IV	11	11	10	10

7

[*Internal Assessment* : 15 Marks]

GROUP – B

[*Marks* : 50]

Answer Q. No. 5 and any two from the rest

5. Answer the following :

(a) State the Group Replacement Policy.   2

(b) A queueing system is specified by the notations $(a / b / c) : (d / e)$. State what a, b, c, d and e represent for ?   2

(c) Explain — "Dummy Activity".   1

6. (a) Consider the following network :

     Three time estimates for activities are given along the arrows. Determine the critical path ? What is the probability that the project will be completed in 20 days (68·46% corresponds to normal variate 0·48)   8
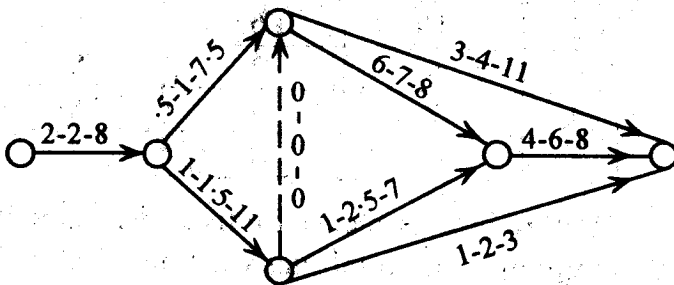
(b) The following rates have been observed for a certain item :

End of month : 1 2 3 4 5
Probability of
Failure of date : ·10 ·30 ·55 ·85 1·00

The cost of replacing an individual item is Rs. 1·25. If the cost of group replacement is 50 paise per item, find the optimum period of group replacement. 7

7. (a) There are five jobs, each of which must go through machines A, B, C in the order $\overrightarrow{ABC}$. Processing times are given in the following table :

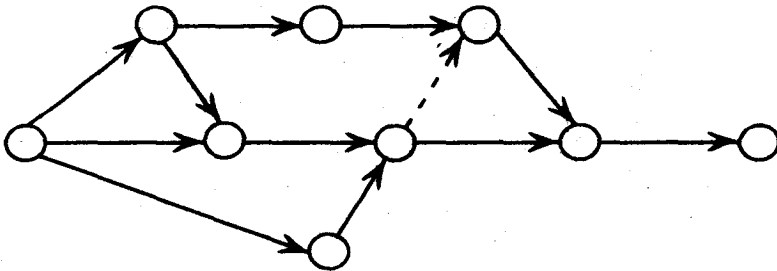| Jobs	Machine A	Machine B	Machine C
1	8	5	4
2	10	6	8
3	6	2	8
4	7	3	6
5	11	4	5

Determine a sequence for five jobs that will minimize the total elapsed time. Find the elapsed time also. 7

. (Continued)

(b) Derive the optimal order level for the inventory model of a single item with instantaneous replenishment, uniform demand, shortages are allowed and fully backlogged, zero lead time, order is placed at the beginning of each cycle. Find the optimum time period and minimum average cost. 8

8. (a) Derive the difference-differential equations for the $(M/M/1 : \infty / FCFS)$ queueing system in steady state condition. 9

(b) (I) Draw the network with the following constraints : 4

  (i) A and B are start jobs/activities
  (ii) A controls C, D and E
  (iii) B controls F and K
  (iv) G depends on C
  (v) H depends on D
  (vi) E and F control J and M
  (vii) L depends on K
  (viii) M is controlled by L
  (ix) G, H, J and M are the last jobs/ activities.

(*II*) Number the nodes of the following
network : 2

[*Internal Assessment* : 15 Marks]

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