PG – 909

III Semester M.C.A. Examination, August 2021
(Y2K5)
COMPUTER SCIENCE
3E5A : Computer Based Optimization Techniques

Time : 3 Hours Max. Marks : 80

Instruction : *Answer **any five full** questions, by choosing atleast **two** from **each** Part.*

PART – A

1. a) Define a Linear Programming Problem (LPP).

   b) A company produces two products A and B. The sales volume for A is atleast 80% of the total sale of both A and B. However, the company cannot sell more than 100 units of A per day. Both products use one raw material, of which the maximum daily availability is 240 kgs. The usage rates of the raw material are 2 kgs per unit of A and 4 kgs per unit of B. The profit per unit of A and B are Rs. 20 and Rs. 50 respectively. Formulate the above as an LPP maximizing the total profit.

   c) For the LPP formulated in 1 b) obtain two basic feasible solutions (b.f.s's).

   (3+8+5)

2. a) Use the graphical method to solve the following problem

   Minimize $Z = 15x_1 + 20x_2$

   Subject to $x_1 + 2x_2 \geq 10$

   $2x_1 - 3x_2 \leq 6$

   $x_1 + x_2 \geq 6$

   and $x_1 \geq 0, x_2 \geq 0$

   Indicate the b.f.s's in the graph.

   b) Solve the following LPP by using simplex method

   Max : $Z = 45x_1 + 80x_2$

   $5x_1 + 20x_2 \leq 400$

   Subject to : $10x_1 + 15x_2 \leq 450$

   $x_1, x_2 \geq 0$

   (8+8)

P.T.O.

3. Find an initial basic feasible solution for the following transportation problem using

   a) The north-west corner method

   b) The Vogel approximation method

	D_1	D_2	D_3	D_4	
S_1	11	13	17	14	250
S_2	16	18	14	10	300
S_3	21	24	13	10	400
	200	225	275	250	

   c) Also obtain an optimum basic feasible solution. **(4+5+7)**

4. a) Explain the Hungarian algorithm to solve an assignment problem.

   b) A department head has four subordinates and four tasks have to be performed. Subordinates differ in efficiency and tasks differ in their intrinsic difficulty. Time taken by each man to perform each task is given in the following matrix. How the tasks should be allocated to each person so as to minimize the total man-hours ?

Subordinates →	1	2	3	4
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

(8+8)

PART – B

5. a) Explain the steps involved in dual simplex method.

   b) Solve the following LPP using the Dual Simplex method :

   Min : $Z = 2x_1 + x_2$

   $3x_1 + x_2 \geq 3$

   $4x_1 + 3x_2 \geq 6$

   Subject to : $x_1 + 2x_2 \geq 3$

   $x_1, x_2 \geq 0$ **(8+8)**

6. a) Describe the M | M | 1 queueing system.

   b) A self-service store employees one cashier at its counter where 9 customers arrives on an average of every 5-minutes. Assuming that the system is an M | M | 1 system. Find (cashier can serve 10 in 5 minutes), average number of customers in the system, average time spent by a customer in the system.

   c) Derive the steady state probability distribution of system size in a M| M | 1 queueing system. **(5+3+8)**

7. a) A small project consists of the following activities (with times) :

Activity	Immediate Predecessor	Time
A	None	6
B	None	8
C	A	6
D	B	5
E	C, D	6
F	A	7
G	B	9

Draw the network diagram and identify the critical path. Compute total float for each activity.