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24271-C

B.C.A. (Fourth Semester)

Examination, 2024

BCA-403

(Optimization Techniques)

Paper : Third

Time : Three Hours] *[Maximum Marks : 70*

Note : Attempt questions from **all** sections as per instructions.

Section-A

Note : Attempt all parts of this question. Give answer of each part in about 50 words.

1½×10=15

1. (a) What is general and standard linear programming problem?

   (b) What is an artificial variable technique to solve L.P.P.?

P.T.O.

(c) What do you understand by Transportation problem?

(d) What do you understand by degeneracy in a transportation problem?

(e) Explain sequencing problem.

(f) What is PERT and CPM in optimization techniques?

(g) What are the common errors for drawing network diagram?

(h) Define the Assignment problem in Transportation problem.

(i) Define the concept of duality in Linear Programming Problem.

(j) What is Bellman's principle of optimality?

Section-B

(Short Answer Type Questions)

Note : Attempt all questions. Give answer of each question in about 200 words.

7×5=35

2. A city hospital has the following daily

requirements of nurses at the minimal level:

Period	Clock Time (24 hours a day)	Minimal no. of of nurses required
1	6 a.m. - 10 a.m.	2
2	10 a.m. - 2 p.m.	7
3	2 p.m. - 6 p.m.	15
4	6 p.m. - 10 p.m.	8
5	10 p.m. - 2 a.m.	20
6	2 a.m. - 6 a.m.	6

Nurses report to the hospital at the beginning of each period and work for 8 consecutive hours. The hospital wants to determine minimal number of nurses to be employed, so that there will be sufficient number of nurses available for each period. Formulate this as LP model by setting up appropriate constraints and objective function.

Solve the following L.P.P. by Graphical method.

Maximise

$'Z'=2x_1+3x_2$ (Subject to Constraints)

$x_1+x_2 \leq 400$

$2x_1+x_2 \leq 600$

$x_1, x_2 \geq 0$ (Non-negativity constraints)

3. Solve the following L.P.P. using Simplex method.

Max $z=40x_1+35x_2$

subject to

$2x_1+3x_2 \leq 60$

$4x_1+3x_2 \leq 96$

$x_1, x_2 \geq 0$

OR

Write the dual of the following problem. Show that the optimal solution for primal and dual are same.

Minimise $'Z'=4x_1+3x_2+6x_3$

subject to

$x_1+x_3 \geq 2$

$x_2+x_3 \geq 5$

$x_1, x_2, x_3 \geq 0$

4. Obtain an optimal solution for the transportation problem by MODI method given in this table:

		Destination				
		D_1	D_2	D_3	D_4	Supply
Source	S_1	19	30	50	10	7
	S_2	70	30	40	60	9
	S_3	40	8	70	20	18
Demand		5	8	7	14	

OR

Explain the mathematical representation of Transportation problem.

5. Solve the following assignment problem and find the minimum cost.

Jobs		I	II	III	IV
Workers	A	10	12	19	11
	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

OR

There are five jobs, each of which is to be processed through machines A, B and C in order ABC. Processing times in minutes are:

Jobs	1	2	3	4	5
A	6	16	14	10	8
B	8	10	2	4	6
C	14	18	10	12	20

Determine the optimum sequence for the five jobs and the minimum elapsed time. Also find the idle time for the three machines and waiting time for the jobs.

6. Under what circumstances is CPM better than PERT? https://www.vbspustudy.com

OR

What is recursive nature of computation in dynamic programming?

Section-C

(Long Answer Type Questions)

Note : Answer any two questions. Give answer of each question in about 500 words.

$10 \times 2 = 20$

7. Find the initial feasible solution of the

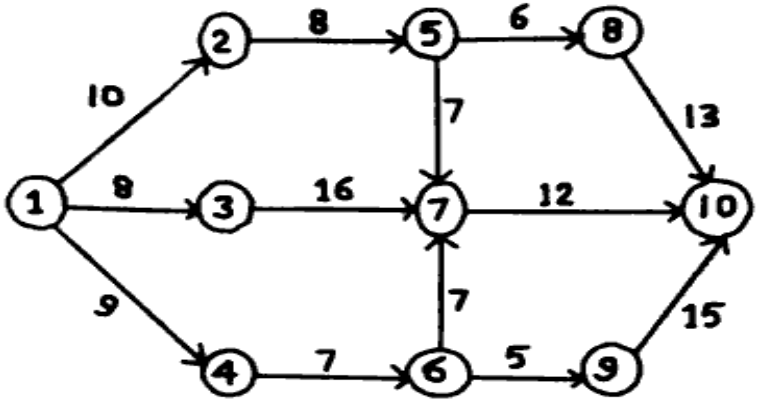
following transportation problem using Vogel's Approximation Method.

Destination					
Origin	1	2	3	4	Supply
1	20	22	17	4	120
2	24	37	9	7	75
3	34	37	20	15	25
Demand	60	40	30	110	240

8. A salesman want to visit cities A, B, C, D and E. He does't want to visit any city twice before completing his tour of all cities and wishes to return to the point of starting journey. Cost of going from one city to another (in Rs.) is given in the table below. Find the least cost route.

		To				
		A	B	C	D	E
From	A	∞	2	5	8	1
	B	6	∞	3	9	2
	C	8	7	∞	4	8
	D	13	4	7	∞	5
	E	1	3	2	8	∞

9. Determine the early start and late start in respect of all node points and identify critical path for the following network.



10. Explain the rules for converting a Primal into Dual with a suitable example.
11. Write the short notes on:
    (a) Hungarian approach of an Assignment problem
    (b) The Big M method