

**SVKM**  
**Mithibai College (Arts, Sci & Comm)**

**Programme: B.Sc (Computer Science) - (CBCGS)**

**Year: III/Semester V(Exam Year: 2023-2024)**

**Subject: OPTIMIZATION TECHNIQUES**

**Date: 26 Oct 2023**

**Time: 10:30 am to 01:00 pm (02:30 Hrs.)**

**Max. Marks: 75**

**FINAL EXAMINATION (Acad. Year:2023-2024)**

Instructions:

1. This question paper contains 3 pages.
2. Answer to each new question to be started on a fresh page.
3. Figure in right hand side indicates full marks
4. Use of Scientific Calculator is allowed
5. Assume suitable data if required.
6. Neat and clear graphs , tables are expected wherever required

**Q.1      Attempt any Three questions.      15**

- a Define the term operation research and explain various operation research models in brief. (any 4)
- b Solve LPP by graphical  
Maximize  $z=3x_1+5x_2$   
Subject to:  
 $x_1+x_2 \leq 2$   
 $2x_1+x_2 \geq 3$   
 $x_1, x_2 \geq 0$
- c Solve by Simplex  
Maximize  $Z=10x_1+x_2+2x_3$   
Subject to :  
 $x_1+x_2-2x_3 \leq 10$   
 $4x_1+x_2+x_3 \leq 20$   
 $x_1, x_2, x_3 \geq 0$
- d Solve LPP by graphical and justify it is the case of multiple solution case.  
Maximize  $=10x_1+6x_2$   
Subject to  
 $5x_1+3x_2 \leq 30$   
 $x_1+2x_2 \leq 18$   
 $x_1, x_2 \geq 0$

**Q.2      Attempt any Three questions.      15**

- a Solve by penalty simplex method (three iterations)  
Minimize  $z = 40x_1 + 60x_2$   
subject to  
 $2x_1 + x_2 \geq 70$   
 $x_1 + x_2 \geq 40$   
 $x_1 + 3x_2 \geq 90$   
 $x_1, x_2, x_3 \geq 0$
- b Convert following primal into dual

Maximize  $Z=2x_1+5x_2+6x_3$

Subject to:

$2x_1+6x_2+x_3 \leq 4$

$2x_1-x_2-4x_3 \geq -4$

$3x_1+3x_2+7x_3 \geq 1$

Minimize  $Z=x_1+x_2+x_3$

Subject to:

$x_1-3x_2+4x_3 \leq 5$

$x_1-x_3 \geq 9$

$2x_2-x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$	$x_1, x_2, x_3 \geq 0$
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- c Consider following problem. Compute replacement ratio to find answer using simplex method.

Minimize  $Z = 2x_1 + x_2$

Subject to:

$$3x_1 + x_2 \geq 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 3$$

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

- d Draw a flowchart representing “No Solution Case” in Simplex Method.

Q.3 **Attempt any Three questions.**

15

- a Five swimmers are eligible to complete in a relay team which consist of 4 swimmers and 4 different styles of swimming.

Four different styles are back\_stroke, Breast\_stroke, free\_style and butterfly. Duration is mentioned in seconds.

The names of 5 swimmers are : Varun, Vicky, Hritik, Ranbir, Ranveer

Varun does Back\_stroke in 69 , Breast\_stroke in 75.

Vicky does Breast\_stroke in 76, free\_style in 61 and butterfly in 80.

Hritik does Back\_stroke in 70, Breast\_stroke in 80, free\_style in 65 and butterfly in 72.

Ranbir does Back\_stroke in 50, Breast\_stroke in 100, free\_style in 62 and butterfly in 84.

Ranveer does Back\_stroke in 47, Breast\_stroke in 110, free\_style in 101 and butterfly in 90.

**Which swimmer should be assigned to which swimming style?**

- b Consider the following payoff matrix

	1	2	3	4
A	8	6	2	8
B	8	9	4	5
C	7	5	3	5

Determine the saddle point if exists.

- c Find Optimum Solution for the following transportation problem. Get IBFS with VAM.

	D1	D2	D3	D4	Supply
S1	6	4	1	5	14
S2	8	9	2	7	16
S3	4	3	6	2	5
demand	6	10	15	4	

- d Describe various steps in decision theory.

Q.4 **Attempt any Three questions.**

15

- a Use Bisection method :  $x^5 + 5x + 1$

- b Use regula falsi method to find  $f(x) = e^x - 4x$  interval (0,1)

- c Use interpolation to interpolate the  $f(0.21)$  from the given data

x	0.20	0.22	0.24	0.26
f(x)	1.6596	1.6698	1.6804	1.6912

- d Develop flowchart for newton backward interpolation.

Q.5 **Attempt any Three questions.**

15

- a Solve by Simplex

Maximize  $Z = 12x_1 + 3x_2 + x_3$

Sub to

$$10x_1 + 2x_2 + x_3 \leq 100$$

$$7x_1 + 3x_2 + 2x_3 \leq 77$$

$$2x_1 + 4x_2 + x_3 \leq 80 \quad ; \quad x_1, x_2, x_3 \geq 0$$

- b** Solve by two phase simplex method

$$\text{MIN } z = 5x_1 + 2x_2 + 10x_3$$

subject to

$$x_1 - x_3 \leq 10$$

$$x_2 + x_3 \geq 10$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

- c** Solve following assignment problem

2.5	5	1	6	1
2	5	1.5	7	3
3	6.5	2	8	3
3.5	7	2	9	4.5
4	7	3	9	6
6	9	5	10	6

- d** Explain the importance of sequencing problem in the optimization technique.

19 OCT 2022

SVKM'S  
Mithibai College of Arts, Chauhan Institute of Science &  
Amrutben Jivanlal College of Commerce and Economics (Autonomous)  
Academic Year (2022-23)

Class: T.Y.B.Sc      Semester: V

Program: B.Sc Computer Science  
Course Name: Optimization Techniques  
Course Code: USMACS504  
Date:

Max. Marks: 75  
Time: 10:30 a.m to 1:00 p.m  
Duration: 2 hrs 30 minutes

REGULAR EXAMINATION

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**Instructions:** Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

- 1) This question paper contains 4 pages.
- 2) All questions carry equal marks.
- 3) Answer to each new question to be started on a fresh page.
- 4) Figures in brackets on the right hand side indicate full marks.
- 5) Assume Suitable data if necessary or not given. Mention is clearly.
- 6) Use of Scientific calculator is allowed.

**Q.1 Attempt any Three.**

21

A Solve by simplex method (up to 4 iterations)

7

Maximize  $Z = 3x_1 + 5x_2 + 4x_3$

subject to the constraints

$$2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_3 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

B Apply LPP by graphical method to solve:

7

Maximize  $Z = 8x_1 + 16x_2$ , subject to

$$x_1 + x_2 \leq 200$$

$$x_2 \leq 125$$

$$x_1 + 2x_2 \leq 300$$

$$\text{and } x_1, x_2 \geq 0$$

Mention drawback of graphical method. (Show calculations and rough work if any)



**Q.3 Attempt any Three.****21**

- A Develop an algorithm to get optimal solution from IBFS in transportation problem. Apply 7  
the same in the given IBFS. Allocations are given in square brackets.

	A	B	C	D	Supply
X	13	7 [200]	19	0	200
Y	17	18 [120]	15	7 [380]	500
Z	11 [180]	22	14 [100]	5 [20]	300
demand	180	320	100	400	

- B A company has three factories F1 F2 and F3 with capacities of 200 units each. There are 7  
three warehouses W1 W2 W3 with demands of 175, 200 and 250 units respectively. Unit  
profit is given below.

Find the transportation cost using VAM. Write steps too.

	W1	W2	W3
F1	17	26	39
F2	15	28	32
F3	19	22	34

- C Solve following assignment problem. What is the meaning of – mentioned in the 7  
problem? Explain in brief.

12	3	6	-	5	9
4	11	-	5	-	8
8	2	10	9	7	5
-	7	8	6	12	10
5	8	9	4	6	1



**Q.3 Attempt any Three.****21**

- A Develop an algorithm to get optimal solution from IBFS in transportation problem. Apply 7  
the same in the given IBFS. Allocations are given in square brackets.

	A	B	C	D	Supply
X	13	7 [200]	19	0	200
Y	17	18 [120]	15	7 [380]	500
Z	11 [180]	22	14 [100]	5 [20]	300
demand	180	320	100	400	

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12	3	6	-	5	9
4	11	-	5	-	8
8	2	10	9	7	5
-	7	8	6	12	10
5	8	9	4	6	1



D What do you mean by travelling sales man problem and solve following?

7

$\infty$	4	7	3	4
4	$\infty$	6	3	4
12	11	$\infty$	7	5
8	8	7	$\infty$	7
9	9	5	7	$\infty$

**Q.4 Attempt any Three.**

12

A Define the term Operation research and specify its characteristics.

4

B When the solution is considered as pseudo optimum? Provide example.

4

C How to check whether the solution is alternate solution or not in simplex method?

4

D Explain the term rim condition and IBFS.

4