



GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (Second Semester) Examinations, November – 2023

WPPEMT2031 – Operations Research

(Mathematics)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions

(14 x 5 = 70 Marks)

- | | Marks |
|--|------------------------|
| 1.a. Solve the following LPP by using Simplex method | 14 |
| Minimize $Z = x_1 - 3x_2 + 2x_3$ | |
| Subject to $3x_1 - x_2 + 2x_3 \leq 7$, | |
| $-2x_1 + 4x_2 \leq 12$, | |
| $-4x_1 + 3x_2 + 8x_3 \leq 10$ | $x_1, x_2, x_3 \geq 0$ |

- | | |
|--|---------------|
| 2.a. Solve the following LPP by using Revised Simplex method | 14 |
| Maximize $Z = x + y$ | |
| Subject to $3x + 3y \leq 6$, $x + 4y \leq 4$ | $x, y \geq 0$ |

- | | |
|--|----|
| 3.a. Find the optimum solution (MODI Method) of Transportation problem | 10 |
|--|----|

	A	B	C	D	supply
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
Demand	5	10	12	15	

- | | |
|----------------------------------|---|
| b. Solve the Assignment problem. | 4 |
|----------------------------------|---|

	A	B	C	D
1	10	12	19	11
2	5	10	7	8
3	12	14	13	11
4	8	15	11	9

- | | |
|---|---------------|
| 4.a. Solve the Integer programming problem by using Branch and bound method | 14 |
| Maximise $Z = 2x + 3y$ | |
| Subject to $6x + 5y \leq 25$, $x + 3y \leq 10$, | $x, y \geq 0$ |
| 5.a. Solve the non-linear programming problem by using Kuhn-Tucker Conditions | 14 |
| Min $Z = 10x_1 - x_2^2 - x_3^2 + 10x_4$ | |

Subject to $x_1 + x_2 \leq 8$, $-x_1 + x_2 \leq 5$, $x_1, x_2 \geq 0$

- 6.a. Solve the non-linear programming problem by Fibonacci search method
 Of $f(x) = -3x^2 + 21.6x + 1$ of range $0 \leq x \leq 25$ at $\epsilon \geq 0.5$ of six interval 14
 a) What is a Quadratic programming
- 7 a. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution with an approximate average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? 6
- b. Arrivals at telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone calls is assumed to be distributed exponentially, with a mean of 3 minutes. 8
- i. What is the probability that a person arriving at the booth will have to wait?
 - ii. The telephone department will install a second booth when convinced that an arrival would expect waiting for at least 3 minutes for a phone call. By how much should the flow of arrivals increase in order to justify a second booth?
 - iii. What is the average length of the queue that forms from time to time?
 - iv. What is the probability that it will take a customer more than 10 minutes altogether to wait for the phone and complete his call?
- 8 a. A company management and the labour union are negotiating a new three-year settlement. Each of these has 4 strategies. 14
 I : Hard and aggressive bargaining
 II: Reasoning and logical approach
 III : Legalistic strategy
 IV : Conciliatory approach.
 The costs to the company are given for every pair of strategy choice

Union Strategies	Company Strategies			
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>
<i>I</i>	20	15	12	35
<i>II</i>	25	14	8	10
<i>III</i>	40	2	10	5
<i>IV</i>	- 5	4	11	0

What strategy will the two sides adopt? Also determine the value of the game.

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