

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
**(MID SEMESTER EXAMINATION MO/2024)**

**CLASS:** B. Tech.  
**BRANCH:** PIE

**SEMESTER:** III  
**SESSION:** MO/2024

**SUBJECT: PE203 OPERATIONS RESEARCH**

**TIME:** 02 Hours

**FULL MARKS:** 25

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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|-----|---|-------|----|
| Q.1 | With a suitable example discuss the various phases in solving an OR problem.  | [5] 1 | 2  |
| Q.2 | Anita Electric Company produces two products, P1 and P2. Products are produced and sold on a weekly basis. The weekly production cannot exceed 25 for product P1 and 35 for product P2 because of limited available facilities. The company employs a total of 60 workers. Product P1 requires 2 man-weeks of labor, while P2 requires one man-week labor. The profit margin on P1 is Rs. 60, and on P2 is Rs. 40. Formulate this problem as an LP problem and solve that using the graphical method. | [5] 1 | 4  |
| Q.3 | A company manufactures two products, X and Y, whose profit contributions are Rs. 10 and Rs. 20, respectively. Product X requires 5 hours on machine I, 3 hours on machine II, and 2 hours on machine III. The requirement for product Y is 3 hours on machine I, 6 hours on machine II and 5 hours on machine III. The available capacities for the planning period for machines I, II, and III are 30, 36, and 20 hours respectively. Determine the optimal product mix using the simplex method.    | [5] 2 | 4  |
| Q.4 | Use duality to solve the problem<br>Minimize $Z = x_1 - x_2$<br>subject to $2x_1 - x_2 \geq 2$<br>$-x_1 + x_2 \geq 10$<br>and $x_1, x_2 \geq 0$<br>Also, find the value of $x_1$ and $x_2$ .  | [5] 2 | 4  |
| Q.5 | Determine the initial basic feasible solution to the following transportation problem using:<br>i) North-west corner method,<br>ii) Vogel's approximation method.   | [5] 3 | 4  |

Distribution Centers						
Plants		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply (Availability)
	S <sub>1</sub>	19	30	50	10	7
	S <sub>2</sub>	70	30	40	60	9
	S <sub>3</sub>	40	8	70	20	18
	Demand (Requirement)	5	8	7	14	

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