**Operations Research**

**September 2023 Examination**

**1. Consider the transportation problem presented in the following table:**

 **D1 D2 D3 D4 Supply**

**S1 19 30 50 10 7**

**S2 70 30 40 60 9**

**S3 40 8 70 20 18**

**Demand 5 8 7 14**

**Find an initial feasible solution using Vogel's Approximation method (VAM), also find the optimal solution using the stepping-stone method. (10 marks)**

**Ans:**

I can explain the concepts of Vogel's Approximation method (VAM) and the Stepping-Stone technique for solving transportation problems and walk you through the steps to find an initial feasible and optimum answer for the given transportation problem.

**Transportation problem**:

The transportation problem involves optimizing the allocation of goods from a set of resources to a group of destinations. Each supply has a constrained supply, and each destination has a specific demand. The objective is to minimize transportation costs while satisfying all supply and

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**2. Consider the transportation problem with plant source and warehouse distribution presented in the following table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source**  |  **WH1**  | **WH2**  | **WH3**  | **WH4**  | **Supply**  |
| **P1**  |  **19**  | **30**  | **50**  | **12**  |  **7**  |
| **P2**  |  **70**  | **30**  | **40**  | **60**  |  **10**  |
| **P3**  |  **40**  | **10**  | **60**  | **20**  |  **18**  |
| **Requirement 5** |  **8**  |  **7** |  **15** |  |

**Find an initial feasible solution using the Northwest corner method and Least cost method, and also find the optimal solution using Modified Distribution (MODI) method. (10 marks)**

**Ans:**

**Introduction:**

Transportation trouble is essential for optimization in supply chain management and logistics. It includes determining the most appropriate allocation of products from several assets (such as plants or factories) to various destinations (which provide warehouses or outlets) while minimizing transportation charges. The problem is characterized by constraints on the delivery and demand quantities and aims to find the most efficient distribution plan.

In this situation, we are offered a transportation hassle involving plant sources and warehouse distribution. The problem is represented in a table, where each row represents a plant (P1, P2,

**3. A small project consisting of eight activities has the following characteristics:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time- Estimates (in weeks) Activity**  | **Preceding activity**  | **Most optimistic time (a)**  | **Most likely time (m)**  | **Most pessimistic time (b)**  |
| **A**  | **None**  | **2**  | **4**  | **12**  |
| **B**  | **None**  | **10**  | **12**  | **26**  |
| **C**  | **A**  | **8**  | **9**  | **10**  |
| **D**  | **A**  | **10**  | **15**  | **20**  |
| **E**  | **A**  | **7**  | **7.5**  | **11**  |
| **F**  | **B,C**  | **9**  | **9**  | **9**  |
| **G**  | **D**  | **3**  | **3.5**  | **7**  |
| **H**  | **E,F,G**  | **5**  | **5**  | **5**  |

**a) Prepare the activity schedule for the project and determine the critical path. (5 marks)**

**Ans:**

To prepare the activity timetable for the venture and decide the critical path, we want to calculate the earliest beginning time (ES), earliest finish time (EF), latest start time (LS), and latest finish time (LF) for each activity.

**Let's start by organizing the given information:**

**b) Suppose a 30-week deadline is imposed, what is the probability that the project will be finished within the time limit? Also, if the project manager wants to be 99% sure that the project is completed on the scheduled date, how many weeks before that date should he start the project work? (5 marks)**

**Ans:**

To calculate the chance that the project may be finished within the time limit, we can use this system evaluation and review technique (PERT). PERT lets us estimate the project length and determine the probability of completing the challenge within a deadline.

First, we need to calculate the expected time (TE) and variance (V) for each activity using the