GUJARAT TECHNOLOGICAL UNIVERSITY

BE 7 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Mine System Engineering - 3172212

Chapter 1: Introduction to systems engineering

Repeated Questions:

1. System, Sub-system and System Environment:

- **Q.** Compare system, sub-system and system environment in detail. **(WINTER 2022, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 7 Marks)**

2. Creativity in Planning and Design:

- **Q.** Discuss the factors influencing creativity, techniques and alternate ideas. **(WINTER 2022, 7 Marks OR; WINTER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR)**
- **Q.** Discuss the Creative aspects of planning and design. **(WINTER 2022, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** List the factors influencing creativity. Also explain the significance of creativity in an organization. **(SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks)**

Other Important Questions:

1. Need of Systems Engineering in Mining:

- **Q.** List the need of system engineering in mining. **(SUMMER 2022, 3 Marks)**

2. System, Sub-system and System Environment:

- **Q.** Define and explain the relation between system, sub-system and system environment. **(SUMMER 2022, 4 Marks)**
- **Q.** Discuss the concepts of system, sub-system and system environment. **(SUMMER 2023, 3 Marks)**
- **Q.** Define the concepts of system. Describe the relation between sub-system and system environment. **(WINTER 2024, 3 Marks)**
- **Q.** What do you understand by 'System Environment' in a mining context? **(SUMMER 2026, 3 Marks OR)**

Chapter 2: Linear Programming

Repeated Questions:

1. LP Model, Assumptions and Applications:

- **Q.** Discuss the application of linear programming. **(WINTER 2022, 3 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** What is a linear programming model? Also write its assumptions. **(WINTER 2022, 4 Marks OR; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR; WINTER 2025, 4 Marks OR)**

2. Graphical Method:

- **Q.** Discuss graphical method of solving Linear Programming Problems. **(WINTER 2022, 4 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks; WINTER 2025, 4 Marks)**

3. Primal and Dual Problems:

- **Q.** Write a short note on Primal and Dual Problem. **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks OR; SUMMER 2024, 3 Marks OR - text missing in PDF but same paper as W23; WINTER 2025, 3 Marks OR)**
- **Q.** Discuss the relationship regarding primal and dual solution. **(SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks)**

Other Important Questions:

1. LP Applications and Assumptions:

- **Q.** Write a note on application of linear programming. **(SUMMER 2022, 3 Marks)**
- **Q.** Enlist the different assumptions of LPP. Discuss each assumption. **(SUMMER 2023, 4 Marks)**
- **Q.** Describe the different assumptions of LPP. **(WINTER 2024, 4 Marks)**

2. Graphical and Simplex Methods (Theory):

- **Q.** Explain the step by step procedure of solving a LPP using graphical method. **(SUMMER 2023, 7 Marks)**
- **Q.** Explain the process of solving a LPP using Simplex method. **(SUMMER 2022, 7 Marks)**
- **Q.** Explain the step by step procedure of solving a LPP using simplex method. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Describe the interpretation of the Simplex table, focusing on the Zj - Cj row. **(SUMMER 2026, 4 Marks OR)**
- **Q.** Define: i. Basic feasible solution ii. Optimal solution **(SUMMER 2022, 3 Marks)**

3. LPP Problems (Numerical):

- **Q.** Consider the following linear programming problem: Maximize Z = 3x + 2y... Find the solution for the above LPP. [Data truncated in source – refer to the original question paper] **(SUMMER 2022, 7 Marks)**
- **Q.** A firm manufactures 3 products A, B and C. the profits are Rs. 3, Rs. 2 and Rs. 4 respectively... Set up an LPP to maximize profit. [Data truncated in source – refer to the original question paper] [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks OR)**

Chapter 3: Transportation and Assignment Problem

Repeated Questions:

1. Transportation Model:

- **Q.** How will you define transportation model. Explain its application in mineral industry. **(WINTER 2022, 4 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks)**
- **Q.** Describe the use of transportation model. **(SUMMER 2023, 4 Marks; WINTER 2024, 4 Marks OR)**
- **Q.** Discuss the types of Transportation models and its variations. **(WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks)**

2. Assignment Problem:

- **Q.** Write short notes on Assignment problem and its application for mineral industry. **(WINTER 2022, 4 Marks OR; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks)**
- **Q.** Discuss the application of assignment problem. **(SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks)**

3. Assignment vs Transportation Problem:

- **Q.** Differentiate assignment problem with transportation problem. **(SUMMER 2023, 4 Marks OR; WINTER 2024, 4 Marks)**

Other Important Questions:

1. Transportation Model – Theory:

- **Q.** Explain the use of transportation model. **(SUMMER 2022, 4 Marks)**
- **Q.** Define transportation model. Explain its application in mineral industry. **(WINTER 2025, 4 Marks)**
- **Q.** Discuss the types of Transportation models. **(WINTER 2025, 7 Marks)**
- **Q.** Discuss the different types of solutions in transportation models. **(SUMMER 2023, 3 Marks OR)**
- **Q.** Discuss the variations on Classical Transportation models and how they are solved for 'Unbalanced' mining problems. **(SUMMER 2026, 7 Marks OR)**

2. Assignment Problem – Theory:

- **Q.** Explain the application of assignment model. **(SUMMER 2022, 4 Marks OR)**
- **Q.** Explain assignment problem and its application in mineral industry. **(WINTER 2025, 4 Marks OR)**
- **Q.** Draw algorithm to solve the assignment problem. **(SUMMER 2023, 7 Marks OR)**

3. Numerical Problems:

- **Q.** Solve the given transportation problem using Vogel's approximation method. [Diagram required – refer to the original question paper] **(WINTER 2024, 7 Marks OR)**
- **Q.** An assignment problem is given below with the cost of assignment as shown below: Calculate the minimum cost of the assignment. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks)**

Chapter 4: Project Management with PERT & CPM

Repeated Questions:

1. Network Construction and Terminology:

- **Q.** Explain the rules to be followed while constructing a network. **(WINTER 2022, 7 Marks; SUMMER 2023, 4 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Define: (i) Dummy activity (ii) Critical activity (iii) Slack time **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks OR; SUMMER 2024, 3 Marks OR; WINTER 2025, 3 Marks OR)**
- **Q.** What do you mean by network technique? Explain its objectives and advantages. **(WINTER 2022, 7 Marks OR; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks)**
- **Q.** Describe the difficulties encountered in the construction of CPM chart and the use of dummy operations. **(SUMMER 2023, 4 Marks; WINTER 2024, 4 Marks)**

2. CPM:

- **Q.** Define CPM. Discuss the system of CPM. **(SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks)**
- **Q.** Explain the advantages and limitations of CPM. **(SUMMER 2023, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** What does a critical path actually signify? In what ways does it differ from any other path? **(WINTER 2022, 4 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks)**

3. PERT:

- **Q.** Write the limitations of PERT. **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks OR; SUMMER 2024, 3 Marks OR; WINTER 2025, 3 Marks OR)**
- **Q.** Define the following terms in PERT: a) Optimistic Time Estimate b) Pessimistic Time Estimate c) Most Likely Time Estimate **(WINTER 2022, 3 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2024, 3 Marks OR; WINTER 2025, 3 Marks)**
- **Q.** How to calculate average and expected time in PERT. **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 4 Marks)**
- **Q.** Explain the procedure for calculating the project completion time in case of probability is given. **(SUMMER 2023, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** Explain the advantages and limitations of PERT. **(SUMMER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR)**

4. CPM vs PERT:

- **Q.** Differentiate between CPM and PERT. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Theory (CPM and PERT):

- **Q.** Compare CPM and PERT. **(SUMMER 2022, 7 Marks OR)**
- **Q.** List the advantages of PERT. **(SUMMER 2022, 3 Marks OR)**
- **Q.** Discuss the three time estimates and expected time for PERT. **(SUMMER 2023, 3 Marks OR)**
- **Q.** What does a critical path actually signify? Explain with one example. **(WINTER 2025, 7 Marks)**
- **Q.** Compare and contrast the assumptions of PERT and CPM regarding time estimates and nature of activities. **(SUMMER 2026, 7 Marks)**

2. Numerical Problems:

- **Q.** Draw the network diagram and determine the critical path for the following project: [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks)**

- **Q.** Information on activity-time duration of a project is provided: Calculate the expected project duration in weeks. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks OR)**
- **Q.** Draw a network diagram corresponding to the following information. Obtain early (E) & late (L) Start & finish time and total float. [Diagram required – refer to the original question paper] **(WINTER 2022, 7 Marks)**

Chapter 5: Network Models

Repeated Questions:

1. Minimal Spanning Tree and Shortest Route:

- **Q.** What do you understand by minimal spanning tree network model? **(WINTER 2022, 3 Marks - Page 2; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** Describe the shortest route and minimal spanning tree problems. **(SUMMER 2023, 4 Marks; WINTER 2024, 4 Marks)**

Other Important Questions:

1. Applications of Network Models:

- **Q.** Write a note on application of network models in mining. **(SUMMER 2022, 3 Marks)**

2. Minimal Spanning Tree:

- **Q.** Write a note on minimal spanning tree network model. **(SUMMER 2022, 4 Marks)**
- **Q.** Explain the 'Minimal Spanning Tree' network model and its role in connecting power grids to various mine sections. **(SUMMER 2026, 4 Marks)**

Chapter 6: Simulation

Repeated Questions:

1. Scope and Limitations of Simulation:

- **Q.** Discuss the scope and limitations of simulation. **(SUMMER 2022, 4 Marks; WINTER 2022, 3 Marks - Page 2; SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** Write the scope and limitations of simulation. **(WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks)**

2. Monte-Carlo Simulation:

- **Q.** Discuss Monte-Carlo simulation system. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR)**
- **Q.** Explain Monte-Carlo simulation procedure. Also discuss its applicability with suitable examples. **(SUMMER 2023, 7 Marks; WINTER 2024, 7 Marks)**

3. Types of Simulation:

- **Q.** Describe the types of simulation process. **(SUMMER 2023, 4 Marks OR; WINTER 2024, 4 Marks)**

Other Important Questions:

1. Simulation Types and Techniques:

- **Q.** Write a note on system type vs. simulation technique. **(SUMMER 2022, 4 Marks OR)**

Chapter 7: Inventory management

Repeated Questions:

1. Inventory System – Characteristics, Necessity and Objectives:

- **Q.** Define inventory. Explain the basic characteristics of an inventory system with advantages. **(WINTER 2022, 7 Marks - Page 2; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** Write short notes on following:- i. Necessity for inventory control ii. Functions performed by inventory **(WINTER 2022, 7 Marks - Page 2; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR)**
- **Q.** Discuss the objective of inventory management. **(SUMMER 2023, 3 Marks OR; WINTER 2024, 3 Marks OR)**

2. EOQ Model:

- **Q.** Write the assumption of EOQ model. **(WINTER 2022, 4 Marks - Page 2; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR; WINTER 2025, 4 Marks OR)**
- **Q.** Explain EOQ model with quantity discount. **(SUMMER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR)**

3. Dynamic Programming in Mineral Industry:

- **Q.** What is the need of dynamic programming for mineral industry? Write some methods for solving dynamic programming problem. **(WINTER 2022, 4 Marks - Page 2; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks)**
- **Q.** Discuss the need of dynamic programming for mineral industry. Describe some methods for solving dynamic programming problem. **(WINTER 2024, 4 Marks OR)**

Other Important Questions:

1. Inventory System and Models:

- **Q.** List the factors to consider for designing an inventory model. **(SUMMER 2022, 3 Marks)**
- **Q.** Write a note on components of inventory model. **(SUMMER 2022, 3 Marks OR)**
- **Q.** Discuss the key parameters of inventory management. **(SUMMER 2022, 7 Marks OR)**
- **Q.** Explain the basic characteristics of an inventory system with advantages. **(WINTER 2025, 7 Marks)**
- **Q.** Define inventory. **(WINTER 2025, 3 Marks)**
- **Q.** Define 'Static vs. Dynamic' inventory problems in the mining industry. **(SUMMER 2026, 3 Marks)**

2. EOQ Model:

- **Q.** Explain EOQ model. **(SUMMER 2022, 4 Marks OR)**
- **Q.** Discuss the 'EOQ model with quantity discounts' and its impact on the total annual cost of mining supplies. **(SUMMER 2026, 7 Marks OR)**

3. Dynamic Programming:

- **Q.** Write the need of dynamic programming in mineral industry? **(WINTER 2025, 4 Marks)**

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