CBCS SCHEME

USN | | | | | | | | | | |

17MN751

# Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
## Mine System Engineering

Time: 3 hrs. Max. Marks: 100

***Note: Answer any FIVE full questions, choosing ONE full question from each module.***



### Module-1

1 a. $A_1$, $A_2$, $A_3$ are the acts and $S_1$, $S_2$, $S_3$ are the states of nature. Also known that $P(S_1) = 0.5$, $P(S_2) = 0.4$ and $P(S_3) = 0.1$. Determine the expected value of perfect information for the pay off table given:

| State of Nature | Pay-off Table | | |
|---|---|---|---|
| | $A_1$ | $A_2$ | $A_3$ |
| $S_1$ | 30 | 25 | 22 |
| $S_2$ | 20 | 35 | 20 |
| $S_3$ | 40 | 30 | 35 |

**(08 Marks)**

b. A small ink manufacturer produces a certain type of ink at a total average cost of Rs.3 per bottle and sells at a price of Rs.5 per bottle. The ink is produced over the weekend and is sold during the following week. According to the past experience the weekly demand has never been less than 78 or greater than 80 bottles in his place. Formulate Pay off table. **(06 Marks)**

c. Explain the steps involved in operations research. **(06 Marks)**

**OR**

2 a. Solve the given LPP graphically

Maximize $Z = 8x_1 + 5x_2$

Subject to $2x_1 + 2x_2 \le 500$

$x_1 \ge 150$

$x_2 \ge 250$

$x_1, x_2 \ge 0$ **(10 Marks)**

b. Using Simplex method, solve the LPP:

Maximize $Z = x_1 + x_2 + 3x_3$

Subject to $3x_1 + 2x_2 + x_3 \le 3$

$2x_1 + x_2 + 2x_3 \le 2$

$x_1, x_2, x_3 \ge 0$ **(10 Marks)**

### Module-2

3 a. Use dual simplex to solve the LPP

Min $Z = 2x_1 + x_3$

subject to $x_1 + x_2 - x_3 \ge 5$

$x_1 - 2x_2 + 4x_3 \ge 8$

$x_1, x_2, x_3 \ge 0$ **(10 Marks)**

b. Explain the simulation techniques for equipment selection and production scheduling. **(10 Marks)**

**OR**

4 a. Explain deterministic models. Probabilistic models and their applications to mining. **(10 Marks)**

b. Write the dual of the following LPP and Solve it. Hence find the solution to the primal.

Max $Z = 4x_1 + 2x_2$

subject to $x_1 + x_2 \geq 3$

$x_1 - x_2 \geq 2$

$x_1, x_2 \geq 0$ **(10 Marks)**

## Module-3

5 a. Compare the Initial Basic feasible solution by North West Colour method , Least Cost method and Vogel's approximation method for the given transportation problem. Table 5(a).

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|
| $O_1$ | 6 | 4 | 1 | 5 | 14 |
| $O_2$ | 8 | 9 | 2 | 7 | 16 |
| $O_3$ | 4 | 3 | 6 | 2 | 5 |
| Demand | 6 | 10 | 15 | 4 | |

Table 5(a) **(10 Marks)**

b. Find Initial basic solution by NWC method and optimize the solution by U – V method. Table 5(b).

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | |
|---|---|---|---|---|---|
| $O_1$ | 3 | 1 | 7 | 4 | 250 |
| $O_2$ | 2 | 6 | 5 | 9 | 350 |
| $O_3$ | 8 | 3 | 3 | 2 | 400 |
| | 200 | 300 | 350 | 150 | |

Table 5(b) **(10 Marks)**

**OR**

6 a. A travelling salesman has to visit 5 cities. He wishes to start from a particular city visit each city once and then return to his starting point. Cost of going from one city to another is shown in Table 6(a). Find the least cost route. **(10 Marks)**

| | A | B | C | D | E |
|---|---|---|---|---|---|
| A | ∞ | 4 | 10 | 14 | 2 |
| B | 12 | ∞ | 6 | 10 | 4 |
| C | 16 | 14 | ∞ | 8 | 14 |
| D | 24 | 18 | 12 | ∞ | 10 |
| E | 2 | 6 | 4 | 16 | ∞ |

Table 6(a)

b. Four Professors are each capable of teaching anyone of the four different subjects. Class preparation time (in hours) for different topics varies from Professors to Professors and is given in Table 6(b). Each Professor should be assigned only one subject. Find the schedule so as to minimize the total subject preparation time following all subjects Professors.

| | $S_1$ | $S_2$ | $S_3$ | $S_4$ |
|---|---|---|---|---|
| $P_1$ | 2 | 10 | 9 | 7 |
| $P_2$ | 15 | 4 | 14 | 8 |
| $P_3$ | 13 | 14 | 16 | 11 |
| $P_4$ | 3 | 15 | 13 | 8 |

Table 6(b) **(10 Marks)**

## Module-4

7 A project consists of the following jobs and their duration.

| Activity | Precedence | Duration (in days) |
|---|---|---|
| A | - | 10 |
| B | A | 9 |
| C | A | 6 |
| D | B | 7 |
| E | B | 5 |
| F | C, D | 9 |
| G | E, F | 8 |

i) Draw a network diagram
ii) Identify the critical path
iii) find the project duration
iv) calculate the floats – Total, Free, Independent and Interference
v) Compute Slack time for each event. **(20 Marks)**

**OR**

8 The three times estimates of a certain project are given below:

| Activity | Time optimist | Time Normal | Time Pessimistic |
|---|---|---|---|
| 0 – 1 | 2 | 3 | 4 |
| 1 – 3 | 15 | 16 | 17 |
| 1 – 2 | 3 | 6 | 9 |
| 1 – 4 | 6 | 10 | 14 |
| 2 – 3 | 4 | 8 | 12 |
| 3 – 4 | 3 | 5 | 7 |
| 4 – 5 | 2 | 3 | 4 |

i) Draw network, find the control path
ii) If the scheduled time for the end event is equal to the earliest expected time of the last event, find the probability of completion of project work
iii) If the scheduled time is 28 days, find the probability of completion of the project work. **(20 Marks)**

## Module-5

9 a. Explain in detail each characteristics of queuing system. **(12 Marks)**
b. Explain pure birth and pure death models. **(08 Marks)**

**OR**

10 a. List the characteristics or features of a Game. **(06 Marks)**
b. What are the assumptions made for a two person – zero sum game? **(06 Marks)**
c. Solve the following game with the pay off matrix:

| | | Player B | | | |
|---|---|---|---|---|---|
| | | $B_1$ | $B_2$ | $B_3$ | $B_4$ |
| Player A | $A_1$ | 1 | 7 | 3 | 4 |
| | $A_2$ | 5 | 6 | 4 | 5 |
| | $A_3$ | 7 | 2 | 0 | 3 |

**(08 Marks)**

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