B.E. Mining Engineering Seven Semester

MN705 - Mine Systems Engineering

P. Pages : 3 **GUG/W/18/1846**

Time : Three Hours * 1 4 4 5 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Marks are indicated to the right.

1. Define system ? State types of systems. Also explain in brief the various types of decision making environments. **16**

OR

2. A company is contemplating the introduction of a revolutionary new product with new packaging & replace the existing product at much higher price (S_1). It may even make a moderate change in the composition of the existing product, with a new packaging at a small increase in price (S_2), or may do a small change in the composition of existing product, backing it with the word 'New' and a negligible increase in price (S_3). The three possible states of nature are - **16**

i) High Increase in sales (N_1)
ii) No change in sales (N_2)
iii) Decrease in sales (N_3)

The company has worked out the pay offs in terms of yearly net profits for each of the strategies of three events (sales). This is represented in the table below.

Strategy	States of Nature		
	N_1	N_2	N_3
S_1	700000	300000	150000
S_2	500000	450000	0
S_3	300000	300000	300000

Which strategy should be chosen ? Answer on the basis of -

i) Maximum criterion ii) Maximax criterion
iii) Regret criterion iv) Laplace criterion

3. Use graphical method to solve the following LPP. **16**

Maximise $Z = 3x_1 + 2x_2$

subject to constraints

$x_1 - x_2 \geq 1$

$x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

Support your answer with detailed explanation and also state the limitations of graphical method.

OR

4. Use Big M method to solve LPP **16**

Maximise $Z = x_1 + 2x_2 + 3x_3 - x_4$

subject to constraints

i) $x_1 + 2x_2 + 3x_3 = 15$

ii) $2x_1 + x_2 + 5x_3 = 20$

iii) $x_1 + 2x_2 + x_3 + x_4 = 10$

5. Research and development department is developing a new transportation system. It has broken down the job into following activities given below : **16**

Activity	Predecessor Activity	Expected time (days)
A	-	5
B	A	7
C	B	2
D	B	3
E	C	1
F	D	2
G	C	1
H	E, F	3
I	G, H	10

Draw the network diagram and estimate the total critical time for the project.

OR

6. Discuss applications of dynamic programming with suitable examples. **16**
State Bellman's "principle of optimality" and explain with the help of illustrative example how it can be used to solve multistage decision problems.

7. A mining company wishes to determine the level of stock to be kept in its store. The demand is not certain and there is a lead time for stock replenishment. Following information is available for product under consideration. **16**

Demand (units / day)	Probability
3	0.10
4	0.20
5	0.30
6	0.30
7	0.10

Carrying cost (per unit / day) = ₹ 2/-
Ordering cost (per order) = ₹ 50/-
lead time = 3 days
Stock on hand at the beginning of the simulation = 20 units
Carry out simulation run over a period of 10 days with the objective of evaluating the inventory rule given below :
Order 15 units when present inventory plus any outstanding order falls below 15 units.
Use Random Numbers in the sequence of 0, 9, 1, 1, 5, 1, 8, 6, 3, 5 using the first number for day one. [State Assumptions made if any]

OR

8. State and explain the terms used in Inventory control : **16**

i) Maximisation of Inventory
ii) Minimisation of Inventory
iii) Reorder level
iv) Danger level

Why inventory is called as 'Necessary Evil' ?

9. A company has four manufacturing plants and five warehouses. Each plant manufacturers the same product, which is sold at different prices in each warehouse area. The cost of manufacturing and cost of raw materials are different in each plant due to various factors. The capacities of the plants are also different. The relevant data is provided in the table below. **16**

Item ↓ → Plant	1	2	3	4
Manufacturing cost (₹ per unit)	12	10	8	8
Raw Material cost (₹ per unit)	8	7	7	5
Capacity per unit time	100	200	120	80

The company has five warehouses. The sale price, transportation cost and demand per unit (₹) is given in the table below.

Ware house	Transportation Cost				Sale Price (₹/Unit)	Demand per unit (₹)
	1	2	3	4		
A	4	7	4	3	30	80
B	8	9	7	8	32	120
C	2	7	6	10	28	150
D	10	7	5	8	34	70
E	2	5	8	9	30	90

a) Formulate this problem as a transportation problem to maximise profit.
b) Find Initial basic feasible solution using VAM.
c) Test the above solution for optimality and find optimal solution.

OR

10. A mining engineer wishes to put four repairmen to four different jobs. The repairmen have different kinds of skills and they exibit different levels of efficiency from one job to another. The mining engineer has estimated the no. of man hours that would be required for each job man combination. This is given in the matrix below. **16**

Job → / Man ↓	A	B	C	D
1	5	3	2	8
2	7	9	2	6
3	6	4	5	7
4	5	7	7	8

Find the optimal assignment that will result in minimum man hours needed.

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