

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021**

**Subject Code:3172212**

**Date:15/12/2021**

**Subject Name:Mine System Engineering**

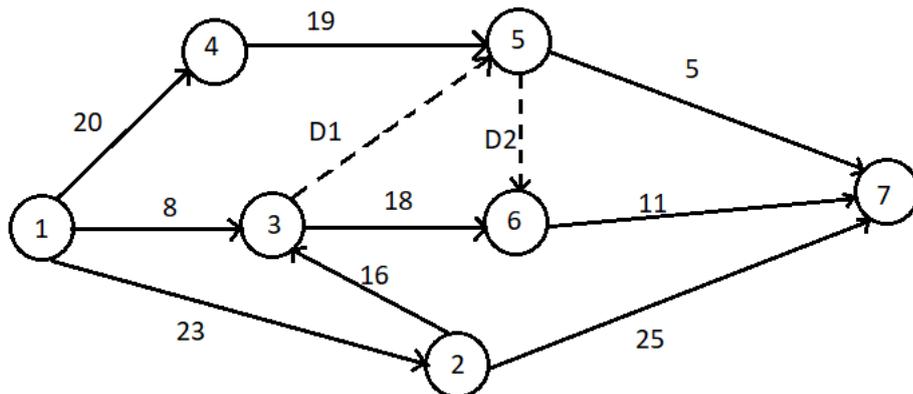
**Time:10:30 AM TO 01:00 PM**

**Total Marks: 70**

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- |            |  | MARKS     |
|------------|--|-----------|
| <b>Q.1</b> | (a) Define:  | <b>03</b> |
|            | i. System  |           |
|            | ii. Sub-system   |           |
|            | iii. System environment  |           |
|            | (b) Classify system. Discuss the interaction between system, sub-system and system environment.  | <b>04</b> |
|            | (c) Discuss the factors influencing creativity, techniques and alternate ideas.  | <b>07</b> |
| <b>Q.2</b> | (a) Discuss the application of linear programming.   | <b>03</b> |
|            | (b) Following project network is given with arrows as activities and the numbers by each arrow representing job durations in days. The network has two dummy activities D <sub>1</sub> and D <sub>2</sub> . The minimum competition time of the project in days is _____ | <b>04</b> |



- (c) For a mining company unit transportation cost from a mine to a washery, and supply and demand are below. The total cost of transportation using the Vogel's approximation method is \_\_\_\_\_.

		Washery				Supply
		A	B	C	D	
Mine	M1	30	0	40	20	500
	M2	24	16	22	40	700
	M3	0	32	28	36	800
Demand		300	400	600	700	

**OR**

- (c) A mining project is composed of five activities whose three time estimates in months are given below. Find out: (a). The expected duration of mining project in months. (b). The standard deviation of the project length in months is.

Activity	Estimated duration (months)		
	Optimistic time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	2	5	8
2-4	1	1	7
3-4	2	5	14
4-5	3	6	15

- Q.3 (a)** Define: **03**
- i. Dummy activity
  - ii. Critical activity
  - iii. Slake time
- (b)** Explain the advantages and limitations of PERT. **04**
- (c)** Differentiate between CPM and PERT. **07**

**OR**

- Q.3 (a)** Define: **03**
- i. Optimistic time
  - ii. Pessimistic time
  - iii. Most likely time
- (b)** Write a note on calculation of average and expected time in PERT. **04**
- (c)** Explain the rules to be followed while constructing a network. **07**

- Q.4 (a)** The maximum value of  $Z = 4x + 2y$  subject to the constraints  $2x + 3y \leq 18$ ,  $x + y \geq 10$ ,  $x, y \leq 0$  is? **03**
- (b)** A cement company has three factories which transport cement to four distribution centers. The daily production of each factory, the demand at each distribution centre, and the associated transportation cost per tonne from factory to distribution center are given in the table below. The initial basic feasible solution using the least cost rule is \_\_\_\_\_ . **04**

Factory	Distribution centers				Supply (tonnes/day)
	D1	D2	D3	D4	
F1	20	30	110	70	600
F2	10	0	60	10	100
F3	50	80	150	90	1000
Demand (tonnes/day)	700	500	300	200	

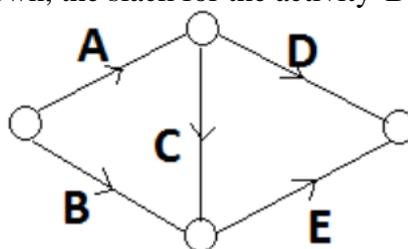
- (c)** The assignment problem given requires four different jobs to be done on four different machines. The minimum cost of assignment is \_\_\_\_\_ . **07**

Jobs	Machine			
	M1	M2	M3	M4
J1	27	35	36	30
J2	33	37	36	35
J3	20	26	28	24
J4	38	29	35	33

**OR**

- Q.4 (a)** For the critical path network shown, the slack for the activity 'B' in months is: **03**

ACTIVITY	DURATION
A	4
B	3
C	5
D	4
E	7



- (b) Three jobs A, B, and C are to be assigned to three machines X, Y, and Z. The processing costs are given below. The minimum total cost of assigning the jobs to the machines is? 04

		Machine		
		X	Y	Z
Jobs	A	19	28	31
	B	11	17	16
	C	12	15	13

- (c) A firm manufactures 3 products A, B and C. the profits are Rs. 3, Rs. 2 and Rs. 4 respectively. The firm has two machines M1 and M2 and below is the required processing time in minutes for each machine on each product. 07

		Product		
		A	B	C
Machine	M1	4	3	5
	M2	2	2	4

Machines M1 and M2 have 2000 and 25000 machine-minutes respectively. The firm must manufacture 100 A's, 200 B's and 50 C's but not more than 150 A's. Set up an LPP to maximize profit.

- Q.5** (a) Write a note on application of network models in mining. 03  
 (b) Discuss the scope and limitations of simulation. 04  
 (c) Discuss Monte-Carlo simulation system. 07

**OR**

- Q.5** (a) Write a note on EOQ model. 03  
 (b) Write a note on minimal spanial tree network model. 04  
 (c) Discuss the key parameters of inventory management. 07

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