MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

## MANIPAL INSTITUTE OF TECHNOLOGY

# I SEMESTER M.TECH. (CONSTRUCTION ENGINEERING & MANAGEMENT)

# END SEMESTER EXAMINATION, NOV-DEC 2023

# **OPTIMISATION TECHNIQUES IN CONSTRUCTION MANAGEMENT [CIE-5110]**

### 30/11/2023

#### TIME: 3 HRS.

### MAX. MARKS: 50

#### Note: 1. Answer all questions.

#### 2. Any missing data may be suitably assumed.

Q.		MARKS	CO	BL					
No.									
1A	Discuss the signific	4	2	4					
	under risk (ii) Most								
1B	A construction con								
	methods (Method A	methods (Method A, Method B, and Method C) for the installation of a specific							
	structural component								
	significant different								
	construction method								
	statistically significa								
	construction method								
	significance level f	6	1	5					
	distribution table as								
	Projects	Method A	Method B	Method C					
	1	8	10	9					
	2	7		8					
	3								
2A	A company wishes	h satisfying all the							
	requirements. The	project requiring one	of these two piec	es of equipment is					
	expected to last 2 or	akhs and of B is ₹ 9							
	Lakhs. Operating co	80,000 or ₹1, 00,000	5	2	5				
	while for B it is estin	ch equipment would							
	you select if you are	sed on,							
	(i) Laplace's prin	ciple with expected va	alues,						
	(ii) Least regret pr	inciple							
	(iii) Hurwitz criter	ion							

28	A construction company (Player A) is bidding on a project, and the project owner (Player B) has two possible contract options. The pay-off matrix below represents the profit (in lakhs of INR) for the construction company based on the chosen bidding strategy and the decision made by the project owner. Solve the following game using graphical method indicating the optimal strategies and game value. What does the game value represent in the context of this construction bidding scenario? The below given pay-off matrix is for Player A. Player B								
	-		Strategies	<b>B</b> <sub>1</sub>	<b>B</b> <sub>2</sub>		5	2	6
			<b>A</b> <sub>1</sub>	-6	7				
		er A	A <sub>2</sub>	-1	-2				
		Play	<b>A</b> 3	-2	5				
			A4	7	-6				
3A	Solve following LPP using Simplex method.Maximise $Z=23x_1+32x_2$ Subject to constraints $10x_1+6x_2 \le 2500$ $5x_1+10x_2 \le 2000$ And $x_1, x_2 \ge 0$							3	6
3B	Discuss degeneracy in transportation problems and its resolution with suitable examples.							4	4
4A	<ul> <li>ABC Construction Company is planning to construct two types of buildings, residential and commercial, to maximize their profit. Determine the optimal number of residential and commercial buildings using graphical method to construct in order to maximize its profit while staying within resource constraints. Net profit in residential buildings is ₹10 lakhs per unit and in commercial buildings it is ₹15 lakhs per unit.</li> <li>i. Labour Constraint: Each residential building requires 50 hours of labour, and each commercial building requires 25 hours of labour. ABC Construction has a maximum of 1,000 labour hours available.</li> <li>ii. Materials Constraint: Each residential building requires 100 units of materials, and each commercial building requires 150 units of materials. ABC Construction has a maximum of 3,000 units of materials available.</li> </ul>						6	3	4
<b>4B</b>	How can you formulate an Assignment problem as a standard linear programming problem? Illustrate.					4	5	4	

5A	Solve the following transportation problem and obtain the optimal solution using MODI method. (The costs given the transportation table are in thousands of INR).										
			D1	D2	D3	D4	Supply				
		S1	5 29	40	60	2 20	7				
		S2	80	40	7 50	2 70	9		5	4	5
		S3	50	8 18	80	10 30	18				
		Demand	5	8	7	14					
5B	ABC Construction Company is planning to assign tasks to its skilled workers for a new construction project. The tasks include excavation (E), concrete pouring (C), bricklaying (B), and roofing (R). The company has identified four skilled workers (W1, W2, W3, and W4) suitable for these tasks. Each worker has different skill levels for each task, and the company wants to minimize the total time required to complete the project. Create an assignment model to allocate skilled workers to different tasks with the goal of minimizing overall time required. The time (in hours) each worker takes to complete each task is as follows:							vorkers for te pouring our skilled vorker has ze the total to allocate verall time	5	5	6
	E C B R										
		W1	5		8	4	6				
	Workers	W2	7		6	9	5				
	<b>W3</b> 4 6 3 8										
	<b>W4</b> 8 7 5 9										