Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. (CEM) END SEMESTER EXAMINATIONS

FEBRUARY 2021

SUBJECT: OPERATIONS RESEARCH AND DECISION THEORY

[CIE 5158]

Date of Exam: **24/02/2021** Time of Exam: **2:00 PM to 5:00 PM** Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

1A. Discuss decision trees in detail with a suitable example — **03** — **CO1**

1B. Solve the following game using graphical method indicating the optimal strategies and game value. The below given pay-off matrix is for Player A — **07** — **CO1**

	B_1	B_2	B_3	B_4
A_1	2	2	3	-2
A_2	4	3	2	6

2A. Discuss Artificial variables in detail in connection with LPP — **02** — **CO2**

2B. Obtain the optimal solution to the following LPP using Big M method. — **08** — **CO2**

Maximize $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 3$

$x_2 \leq 4$

And $x_1, x_2 \geq 0$

3A. Discuss in brief, the unbalanced transportation problems with examples — **02** — **CO3**

3B. Solve the following transportation problem using MODI (u-v) method. The table gives the transportation cost in thousands of Indian Rupees. Initial Basic Feasible Solution is indicated in bold numerals in the north west corner of the cells — **08** — **CO3**

		Destination				Supply(units)
		D_1	D_2	D_3	D_4	
Warehouses	S_1	**25** 8	**2** 10	7	**23** 6	50
	S_2	12	9	**40** 4	7	40
	S_3	9	**30** 11	10	8	30
Demand(units)		25	32	40	23	

4A. Obtain an IBFS to the following transportation problem using VAM. The cost of transportation shown in table are in thousands of Indian Rupees — **03** — **CO3**

	D_1	D_2	D_3	D_4	SUPPLY(units)
S_1	2	3	11	7	6
S_2	1	5	6	1	4
S_3	5	8	15	9	10
DEMAND(units)	8	6	3	3	

4B. Three buildings B1, B2, B3 are to be done by four contractors C1, C2, C3 and C4. Each building can be assigned to one and only one contractor. The cost of construction of each building by each of the contactors is given in the following matrix in Lakhs of Indian Rupees. What are the building assignments which will minimize the cost of construction? — **07** — **CO4**

	C_1	C_2	C_3	C_4
B_1	18	24	28	32
B_2	8	13	17	19
B_3	10	15	19	22

5A. In a store with one server,9 customers arrive on an average of 5 minutes. Service is done for 10 customers in 5 minutes. Find — **03** — **CO4**

(i) The average no. of customers in the system
(ii) The average queue length
(iii) The average time a customer spends in the store

5B. Solve the following LPP using Dynamic Programming — **05** — **CO5**

Maximize $Z=5x_1+2x_2$

Subject to

$x_1+2x_2 \leq 43$

$x_1 \leq 23$

And $x_1, x_2 \geq 0$

5C. Distinguish between Minimum – Span problems and Shortest- Route problems in connection with Network analysis — **02** — **CO5**