	Reg. No.:	
	Name :	

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TERM END EXAMINATIONS (TEE) – August - September 2021

Programme	:	**B.Tech. [BCE]**	Semester	:	**Interim 2021-22**
Course	:	**Operation Research**	Code	:	**MAT2004**
Faculty	:	**Dr. Ajay Kumar Bhurjee**	Slot/ Class No.	:	**C11 / 0184**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART - A (30 Marks)	
1	(a)	A fashion company manufactures four models of shirts. Each shirt is first cut on cutting process in the trimming shop and next sent to the finishing shop where it is stitched, button holed and packed. The number of man–hours of labour required in each shop per hundred shirts is as follows:	10

Shop	Shirt A	Shirt B	Shirt C	Shirt D
Trimming shop	2	1	3	20
Finishing shop	4	9	7	10

Because of limitations in capacity of the plant, no more than 400 man–hours of capacity is expected in trimming shop and 600 man hours in the Finishing shop in the next six months. The contribution from sales for each shirt is as given below: Shirt. *A*: Rs. 6 / per shirt, Shirt *B*: Rs.10/ per shirt, Shirt *C*: Rs. 9/per shirt and Shirt *D*: Rs. 20/ per shirt. Assuming that there is no shortage of raw material and market. Determine the optimal integer solution of the problem.

OR

(b) Solve the following LPP using Revised simplex method: 10

Minimize $Z = x_1 + 4x_2 + 5x_3$

subject to

$$3x_1 + 6x_2 + 3x_3 \leq 22,$$
$$x_1 + 2x_2 + 3x_3 \leq 14,$$
$$3x_1 + 2x_2 - x_3 \leq 14,$$
$$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$$

2 (a) Using Wolfe's modified simplex method to solve the following QPP: 10

Minimize $Z = 2x_1 + x_2 - x_1^2$

subject to

$$2x_1 + 3x_2 \leq 6,$$
$$2x_1 + x_2 \leq 4,$$
$$x_1 \geq 0, x_2 \geq 0.$$

OR

(b) A and B each take out one or two matches and guess how many matches the opponent has taken. If one of the players guesses correctly then the opponent has to pay him as many rupees as the sum of the numbers of matches had by both the players, otherwise the pay-out are zero. Write down the payoff matrix and obtain the optimal strategies for both the players. 10

3 (a) Use the graphical method to minimize the time needed to process job 1 and 2 on the machines as given in the following table: 10

Job 1 Machines					
Sequence	A	B	C	D	E
Time(h)	6	8	4	12	4

Job 2 Machines					
Sequence	B	C	A	D	E
Time(h)	10	8	6	4	12

OR

(b) Draw the critical path and find the project duration for the following network: 10

Activity	Immediate predecessor	Optimistic time(days)	Most likely time (days)	Pessimistic time(days)
A	---	1	3	7
B	A	2	6	14
C	A	3	3	3
D	B,C	4	10	22
E	B	3	7	15
F	D,E	2	5	14
G	D	4	4	4

(i) Draw the project network.
(ii) Find the critical path and compute the expected completion time

PART - B (20 Marks)

4 Solve the following LPP using dual simplex method. 10

$$\text{Max. } Z = 5x_1 - 2x_2 + 3x_3$$

subject to

	$2x_1 + 2x_2 - x_3 \geq 7,$ $3x_1 - 4x_2 \leq 3,$ $x_2 + 3x_3 \leq 5,$ $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$ Also write the solution of its dual problem from the final table.	
5	A repairman is to be hired to repair machines which breakdown at an average rate of 6 per hour. The breakdown follows Poisson distribution. The productive time of a machine considered costing Rs. 20/- per hour. Two repairmen, Mr. X and Mr. Y have been interviewed for this purpose. Mr. X charges Rs. 10/- per hour and he services breakdown machines at the rate of 8 per hour. Mr. Y demands Rs. 14/- per hour and he services on an average rate of 12 per hour. Which repairman should be hired? Assume 8- hour shift per day	10
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