	VI Semester B. Tech. Data Science and Engineering End Semester Examination (May 2023)												
			SUBJE	CT: OPE	RATI	ONS	RE	SEA	、 RCł	H [HUM 3252]			
	Durat	tion: 03	Hours							Max. Marks: 50			
	Instructions to Candidates: Assume missing data if any												
1A	A far corn An a Rs. 4 profi work	A farmer has 1000 acres of land on which he can grow corn, wheat, or soybeans. Each acre of corn costs Rs.100 for preparation, requires 7 man-days of work, and yields a profit of Rs. 30. An acre of wheat costs Rs.120 to prepare, requires 10 man-days of work, and yields a profit of Rs. 40. An acre of Soybeans cost Rs.70 to prepare, requires 8 man-days of work and yields a profit of Rs. 20. The farmer has Rs.100000 for preparation and can count on 8000 man-days of work formulate the methods of the stor dead form											
1 B	Use	Simplex	ormulate the problem as an LPP and write the standard form.3nplex Algorithm to solve the above LPP and determine the maximum profit.3										
1C	How	se Simplex Algorithm to solve the above LPP and determine the maximum profit. ow many acres should be allocated to each crop to maximize profit?											
2A	A sa comp unles need the d	lesman pany. H ss he vi s to plan listance	has been e must tra sits the re n his trave between th	assigned to vel to these maining fou l to minimiz e cities.	five c cities ar citie ze the	eities every es. De total	to provide to provide to provide the provident to provide the provident to provide the provided to pro	omote k and ine th ice tra	e the l shal ne se aveleo	products manufactured by his ll not visit the same city again quence in which the salesman d. The table below summarizes	4		
				•	A	\mathbf{B}	C 7	D	\mathbf{E}				
				B	4	-	6	3	4				
				C	7	6	-	7	5				
				D	3	3	7	-	7				
				D E	4	<u> </u>	5	- 7	/ -				

2B A factory manufactures three products, A, B, and C, for which the data is given below. The profit per unit is Rs.32, Rs.30 and Rs.40 for products A, B and C respectively. Also given below is the final production plan (optimal solution), with reference to the same answer the following questions:

			Resource		Produc				Res	ource			
					Α		B	С	Avai	lability			
			Raw Materials		5		4	3	2	2500			
		-	Machine Hours		2		3	1	1	1275			
			Labor Hours		3		2	4	2	100			
	Р	rofit/	Basic	C	j	32	30	40	0	0	0		
	1	Unit	variable	Q		X1	X 2	X 3	S 1	S 2	S 3		
		0	S 1	17	5	3/2	0	0	1	-1	-1/2		
		30	X 2	30	0	1⁄2	1	0	0	2/5	-1/10		
		40	X 3	37	5	1/2	0	1	0	-1/5	3/10		
			Zj	240	00	35	30	40	0	4	9		
			Cj-Zj			-3	0	0	0	-4	-9		
20	While implementing the production plan, 500 raw materials units must be scrapped as they don't meet the quality specification. Your regular vendor has assured to support you with 200 units. How many units of raw materials you will have to arrange from a new vendor to implement the pre-determined production plan?											3	
2C	previous ques	stion:	question wi		cici		the	opum	ai siiiij				3
	Union members have been demanding a pay hike, and the management has not entertained the												
	same for long. As a result, the employee union has called for a strike. As an operations manager, you anticipate that the logjam will continue for fifteen days. Can the pre-decided												
	production plan implemented under this circumstance? (Assume that the company operates three shifts of eight hours each)												
3A	three shifts of eight hours each). A store requires the following monthly quantities of 3 different sizes of refrigerators:											5	
			Size					В	С				
			No Required					6 24	15				
	The store has	receiv	eived quotations from 4 manufacturers who are able to supply not more than								more than		
	the quantities	below	(of all sizes	comb	ined)					11 /		
	_												
			Man	ufactu	irer	1	1 2	$\frac{2}{3}$	4	_			
	The start f	:	[Max. Supply 24 8 23 5]										
	The store estimates that its profit per refrigerator will vary with size and manufacturer, as												
	snown in the following table:												
					Α	В	C						
				1 (M	lfg)	20	15	13					
				2		19	12	21					
				3		17	13	18					
				4		22	12	18					
	How should t	he ord	ers be optima	ally pl	aced	? Wh	at is t	the mo	onthly p	profit for	the store	e? (Use the	
	Maximum Pro	ofit Ce	ell method to	gener	ate t	he ba	sic fe	asible	solutio	n and th	e MODI	method to	

	optimize).	optimize).										
3B	Suppose the deman increase the supply optimum allocation	d for size B 7. By how n to attain this	increa nuch profit	ases to could	30 uni the ma	ts mon ximum	thly, an profit	nd only increa	manuf se? Als	acturer 2 can so, show the	3	
3C	Suppose the store has already entered into a contract with manufacturer 1 to buy 7 units monthly of size C; what is the maximum sum the store would be willing to pay (per month) to be released from this obligation?										2	
4A 4B	An airline corporation flies eight 2-way flights between Chennai and Delhi according to the schedule below. The crew can return to its home base (Chennai or Delhi) on the same day, provided there is at least 75 minutes layover in the other city. Otherwise, he can return the next day. Given the below data, develop an optimum crew schedule and determine where the crew should be based to minimize total layover by all the crew members. Use the assignment algorithm. $ \frac{\hline Delhi to Chennai}{Flight} \ Departure \ Arrival} \ D1 \ 0730 \ 0930 \ D2 \ 0930 \ 1130 \ D2 \ 0930 \ 1130 \ D4 \ 2000 \ 2200 \ D4 \ 1500 \ 1700 \ 1700 \ 1700 \ 1700 \ 1700 \ 1700 \ 1700$										5	
	to distribution area	3.			Dict	ributio	n Aroo]			
					1 DISU	<u>רוטענוס</u> ס	II Area	2	-			
		Dofinory	1	1	20	180		5	-			
		Keimei y	2	3	00	100		80	-			
			3	2	00	250		120	-			
	Formulate the problem as a transportation model											
4C	In the above refinery problem, suppose that the capacity of refinery 3 is reduced to 6 million gallons. Also, distribution area 1 must receive all its demand and any shortages in areas 2 and 3 will result in a penalty of 5 cents per gallon. Formulate the problem as a transportation model										2	
5A	Trucks start arriving at 10:00 AM in the morning at a supermarket's unloading area every thirty minutes with groceries, vegetables, and other essential commodities. The time required to unload these trucks is randomly distributed and depends upon the size of the truck and the number of bags to be unloaded. The service time distribution is as depicted below.Service time (Hours) 0.5 1 1.5 2 2.5 3 Probability 0.12 0.21 0.36 0.19 0.07 0.05 Develop a Monte-Carlo Simulation worksheet for ten arrivals and calculate the average										4	
	waiting time for true	cks.										

	Use the following Random Numbers: 54, 24, 21, 45, 46, 84, 77, 12, 5, 68							
5B	5B Explain the below concepts with respect to a queuing system:							
	a. Reneging							
	b. Balking							
	c. Jockeying							
5C	A company distributes its products by trucks loaded at its only loading station. It was found	3						
	that, on an average, trucks arrive every five minutes, and the average loading time was three	_						
	minutes. Find:							
	a. The probability that a truck must wait.							
	b. Time spent by a truck either waiting in queue or loading.							
	c. Number of trucks waiting for their turn to get loaded.							

List of formulas:

1 -- $L_{5} = \frac{\lambda}{\mu - \lambda}$ $L_{q} = \frac{\lambda^{2}}{\mu(\mu - \lambda)}$ 5= <u>2</u> 4 $W_{S} = \frac{1}{\mu - \lambda}$ $W_{q} = \frac{\lambda}{\mu(\mu - \lambda)}$