

Semester: Jan	- Mar 24						
Maximum Marks: 50 Examination: ETE Exam Date: 05-04-24 Duration: 3 Hrs	s						
Programme code: 01							
Programme: Master of Business Administration	Class: FY	Trimester: III					
	Name of the department/Section/	Center:					
College: K. J. Somaiya Institute of Management	Business Analytics						
Course Code: 217P01C312	Name of the Course: Decision So	cience					
Instructions:							
1. You have to attempt 5 questions in all. Question 1 is compulsory. Do any 4 questions Questi	on 2 to Question 6. All questions car	ry equal marks.					
2. You will be assessed for your abilities to formulate the O.R. problem, model it in excel, solv	e it with Solver, and interpret the res	sults.					
3. Make suitable assumptions if required and state them.							
4. Write all relevant answers and interpretations in your excel sheet with sufficient details to o	enable a fast evaluation of your answ	ers.					
5. Use Excel and Solver as required and keep saving the file every ten minutes or so.	5. Use Excel and Solver as required and keep saving the file every ten minutes or so.						
6. Make only 1 Excel file with different worksheets pertaining to each question.							
7. Name the files as instructed by the IT staff invigilator.							

Question No.		Max.
		Marks
Q1	Valu-Com Electronics manufactures five different models of telecommunications interface cards for PCs and laptops namely Hyperlink, FastLink, SpeedLink, MicroLink, and EtherLink. Each of these devices require differing amounts of printed circuit board (PC board), resistors, memory chips, and assembly. In its next production period, Valu-Com has 80,000 square inches of PC board, 100,000 resistors, 30,000 memory chips, and 5,000 hours of assembly time available. The company can sell all the product it can manufacture, but the marketing department wants to be sure the company produces at least twice as many FastLink cards as HyperLink cards while maximizing profit. The formulation and the sensitivity report for the same has been given below. Decision Variables: X1 = number of HyperLink cards to produce; X2 = number of FastLink cards to produce; X3 = number of SpeedLink cards to produce; X4 = number of MicroLink cards to produce; X5 = number of EtherLink cards to produce	10

MAX
$$53 X_1 + 48 X_2 + 33 X_3 + 32 X_4 + 38 X_5$$

$$\begin{array}{lll} ST & & 20~X_1+15~X_2+10~X_3+8~X_4+5~X_5 \leq ~80,000 \\ & & 28~X_1+24~X_2+18~X_3+12~X_4+16~X_5 \leq ~100,000 \\ & 8~X_1+8~X_2+4~X_3+4~X_4+6~X_5 \leq ~30,000 \\ & 0.75~X_1+0.6~X_2+0.5~X_3+0.65~X_4+1~X_5 \leq ~5,000 \\ & 2~X_1-1~X_2 \leq 0 \end{array}$$

PC Board Availability Resistors Available Memory Chips Available Assembly Hours Available

Sensitivity Report:

Variable Cells

		Final	Reduced	Objective	Allowable	Allowable
Cell	Name	Value	Cost	Coefficient	Increase	Decrease
\$B\$4	Quantity Made HyperLink	0	-11.66666667	53	11.66666667	1E+3
\$C\$4	Quantity Made FastLink	0	-16	48	16	1E+3
\$D\$4	Quantity Made SpeedLink	1666.666667	0	33	15	
\$E\$4	Quantity Made MicroLink	5833.333333	0	32	1	5.27272727
\$F\$4	Quantity Made EtherLink	0	-9.666666667	38	9.666666667	1E+3

Constraints

		Final	Shadow	Constraint	Allowable	Allowable
Cell	Name	Value	Price	R.H. Side	Increase	Decrease
\$G\$13	PC Board (sq in) Used	63333.33333	0	80000	1E+30	16666.6666
\$G\$14	Resistors Used	100000	0.166666667	100000	35000	1000
\$G\$15	Memory chips Used	30000	7.5	30000	1578.947368	7777.77777
\$G\$16	Assembly Hours Used	4625	0	5000	1E+30	37
\$G\$17	Fast/Hyper>2 Used	0	0	0	1E+30	

Use the above output to answer the following questions. DO NOT SOLVE again:

- **a.** What is the optimal solution and the maximum profit?
- b. Interpret the binding constraints.
- C. How much should the marginal profit on FastLink have to increase before it is considered for production?
- d. If the company could buy 1,000 additional memory chips, should they do it? If so, how much would profits increase?
- **C.** Suppose the marginal profits used in this analysis were estimated hastily and are known to be somewhat imprecise. If the unit profit on SpeedLink has to be increased by 2 and that of MicroLink decreased by 2, how would this impact the optimal solution?

Q2 Hilltop Coffee manufactures a coffee product by blending three types of coffee beans. The cost per pound and the available pounds of each bean are as follows:

Bean	Cost per pound	Available Pounds
1	0.50	500
2	0.70	600
3	0.45	400

Consumer tests with coffee products were used to provide ratings on a scale of 0–100, with higher ratings indicating higher quality. Product quality standards for the blended coffee require a consumer rating for aroma to be at least 75 and a consumer rating for taste to be at least 80. The individual ratings of the aroma and taste for coffee made from 100% of each bean are as follows:

Bean	Aroma Rating	Taste Rating
1	75	86
2	85	88

10

	1												
			:	3	60			75					
	Assume that the aro	oma and tac	ta attributas	of the cof	foo bland will be	a waightad	average	of the attrib	utes of the	haans usad i	in the bland	Hillton	
	Assume that the aroma and taste attributes of the coffee blend will be a weighted average of the attributes of the beans used in the blend. Hilltop mist meet all quality standards while producing 1000 pounds of the blended coffee product.								Типтор				
	mist most an quanty	Starrati	winic produ	ieing 1000 j	ounds of the ole	naca conce	product.						
	Determine the optim	nal quantity	of each bea	an to be use	d in the coffee bl	lend which w	ill minir	mize the ove	rall cost of t	he product.	Formulate a	nd solve	
	the above problem a	s a linear p	rograming p	problem.									
Q3	A. M/S Godrei &	& Bovce ar	nd Hindusta	ın Lever Lt	d. have been sel	ling compet	ing prod	ucts Cinthol	and Liril r	espectively.	The brand i	manager	10
					hould be the firm								
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		-			both the firms w				e for Liril ar	nd Cinthol.			
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	B. Allen Young	has always	s been prou	d of his pe	rsonal investmer	nt strategies	and has	done very v	vell over th	e past sever	al years. He	e invests	
	primarily in the	he stock m	arket. Durii	ng the next	year, Allen mus	t decide who	ether to	invest \$10,0	00 in the st	ock market	or in a certi	ficate of	
	deposit (CD) at a fixed interest rate of 9%. If the market is good, Allen believes that he could get a higher return on his money than with a fair market. If the market is bad, he will most likely get no return at all. The decision matrix denoting the return for the above is given below:							ith a fair					
								Ü					
	market. If the	market is b	ad, he will	most likely	get no return at a			_	_	or the above	is given belo	ow:	
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- b. Also compute the forecast for a 4-year and 5 year simple moving average
- C. Which method results in the most accurate forecasts?

Q6

The three blood banks in Franklin County are coordinated through a central office that facilitates blood delivery to four hospitals in the region. The cost to ship a standard container of blood from each bank to each hospital is shown in the table on this page. Also given are the biweekly number of containers of blood available at each bank and the biweekly number of containers needed at each hospital.

то					
FROM	HOSPITAL 1	HOSPITAL 2	HOSPITAL 3	HOSPITAL 4	SUPPLY
BANK 1	\$8	\$9	\$11	\$16	50
BANK 2	12	7	5	8	80
BANK 3	14	10	6	7	120
DEMAND	90	70	40	50	

- **a.** How many shipments should be made biweekly from each blood bank to each hospital so that total shipment costs are minimized?
- b. Owing to disruptions in the route, Bank 3 cannot deliver to Hospital 3 and Bank 1 cannot deliver to Hospital 1. Does this change the shipment schedule? Re-solve to obtain the optimal schedule in this scenario.

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