SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: June – Sep 24 **Maximum Marks: 50 Examination: ETE Exam Date: 6/11/2024 Duration: 2 Hours**		
Programme code: 1 **Programme: MBA**	**Class:** FY	**Semester/Trimester: I**
College: K. J. Somaiya Institute of Management	**Name of the department/Section/Center: Business Analytics**	
Course Code: 317P01C103	**Name of the Course: Decision Science**	

Instructions:

1. **All questions are compulsory. There is an internal choice in Que 1B and in Que 3.**
2. **Make suitable assumptions if required and state them.**
3. **Write all relevant answers and interpretations in your Excel sheet, with sufficient details in an easily readable manner to enable a fast evaluation of your answers.**
4. **Keep saving the file every ten minutes or so.**
5. **Make only 1 Excel file with different worksheets pertaining to each question.**
6. **The naming convention for the file should have your roll number and name.**
7. **Please follow the instructions of the faculty/IT staff on duty.**

Question No.		Max. Marks
1A	The Garden Avenue Seven sells tapes of its musical performances. The following data show sales for the past 18 months. The group's manager wants an accurate method for forecasting future sales. Month Sales Month Sales Month Sales 1 293 7 381 13 549 2 283 8 431 14 544 3 322 9 424 15 601 4 355 10 433 16 587 5 346 11 470 17 644 6 379 12 481 18 660 a. Use exponential smoothing to forecast this time series. Consider smoothing constants of α = .2, and .4. What value of the smoothing constant provides the best forecast? b. Use trend projection to provide a forecast. What is the value of MSE? c. Which method of forecasting would you recommend to the manager? Why?	10
1B	Computers Unlimited sells microcomputers to universities and colleges on the East Coast and ships them from three distribution warehouses. The firm is able to supply the following numbers of microcomputers to the universities by the beginning of the academic year: **Distribution Warehouse** **Supply (microcomputers)** Richmond 420 Atlanta 610 Washington, DC 340 Four universities have ordered microcomputers that must be delivered and installed by the beginning of the academic year: **University** **Demand (microcomputers)** Tech 520 A & M 250 State 400 Central 380 The shipping costs per microcomputer from each distributor to each university are as follows:	05

		University			
		Tech	**A & M**	**State**	**Central**
Distribution Warehouse	**Richmond**	22	17	13	18
	Atlanta	15	35	20	25
	Washington, DC	28	21	16	14

Solve the problem to determine the minimum shipping cost.

OR

A university department head has five instructors to be assigned to four different courses. All the instructors have taught the courses in the past and have been evaluated by the students. The rating for each instructor for each course is given in the following table (a perfect score is 100):

	Course			
Instructor	**A**	**B**	**C**	**D**
1	80	75	90	85
2	95	90	90	97
3	85	95	88	91
4	93	91	80	84
5	91	92	93	88

The department head wants to know the optimal assignment of instructors to courses to maximize the overall average evaluation. The instructor who is not assigned to teach a course will be assigned to grade exams.

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The Dubai shopping festival is celebrated every year for a month to improve sales. An electronic store wants to restock computers of a specific type for the upcoming festival. The distribution of demand of sales are as follows:

Demand	**Probability**
10	.20
20	.25
30	.40
40	.15

Each computer costs Dh 5,500 and sells at Dh 7,000. A supplier replenishes its stock every day before the store starts its business. When the random demand exceeds the available stock, there is a shortage of computers. In contrast, if the demand is less than the available stock, there will be some unsold computers. If there is a shortage, customers who do not get their computers receive a Dh 200 coupon, which can be redeemed at the store during the festival period. The profit for a day is calculated from the revenue from sold computers and the shortage cost, ignoring coupon redemption. The company replenishes a fresh stock of 25 computers every day.

a. Simulate demand scenarios for 32 days of demand.

b. Determine the service level. (Hint: Ratio of Total Sales/Total Demand)

3

A computer start-up named Pear is considering entering the U.S. market with what they believe to be a smaller and faster computer than some of the existing products on the market. They want to get a feel for whether or not customers would be willing to switch from some of the existing bigger brands to consider their product. They want to collect a reasonable sample from across the United States representative

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of all age brackets. They have split the United States into 2 regions: East and West. They want at least 65% of their sample to cover the East and no fewer than 25% of the West. They also have divided the age groups into 3 categories: 18-35, 3669, and 70 and up. They want at least 50% of their sample to be between 18 and 35 and at least 40% to be between 36 and 69. The costs per person surveyed is given in the table below:

Region	**Age Groups**		
	18-35	**36-69**	**70 and up**
East	$2.50	$2.00	$1.50
West	$3.50	$3.00	$2.00

Assume that at least 1,000 people are to be surveyed. The problem is for Pear Company to decide how many people to survey from each age bracket within each region in order to minimize costs while meeting requirements.

a. Formulate this problem as a linear program and solve to obtain the optimal solution

b. Identify and interpret the binding constraints.

OR

A company is manufacturing two products, A and B. The manufacturing time required to make them, the profit, and the capacity available at each work center are as follows:

Product	*Work centre*			*Profit per unit*
	Machining	*Fabrication*	*Assembly*	*(Rs)*
A	1 hour	5 hours	3 hours	80
B	2 hours	4 hours	1 hour	100
Total capacity	720 hours	1,800 hours	900 hours	

If A and B represent the number of units of products A and B, respectively, we can state the problem as follows:

Max Profit = 80A + 100B

Subject to,

A + 2B <= 720

5A + 4B <= 1800

3A + B <= 900

A, B >= 0

Solve the above problem using Solver and answer the following questions:

a. Suppose that the cost of overtime in each of the departments is Rs 15 per hour. Would it be advisable to go overtime in the Machining department? If yes, then how many hours of overtime can be suggested to the company?

b. Will it be advisable to go overtime in the Fabrication department? If yes, then how many hours of overtime can be suggested to the company?

c. Suppose that a price change is considered for product A. This would raise the profit for this product to Rs 100 per unit. Would this change the optimal production plan?

d. What is the maximum amount of change in profit for product A that would not cause a change in the optimum production plan?

e. How far the unit profit of B may vary without changing the optimal production plan?