Enrolment No. _____

AHMEDABAD UNIVERSITY

AMRUT MODY SCHOOL OF MANAGEMENT

UNDERGRADUATE PROGRAMMES

2023-2024 WINTER SEMESTER

END-SEMESTER EXAMINATION

TOD212 DECISION SCIENCES

SET B

Date: 22-04-2024 Total Marks: 70 Marks

Time: 05:00 pm – 7:30 pm No. of printed pages: 03 pages

Instruction: Each question must be answered. The use of a simple calculator is permitted.

Q: 1 (25 Marks)

Hailey's TV Productions is considering producing a pilot for a comedy series in the hope of selling it to a major television network. The network may decide to reject the series, but it may also decide to purchase the rights to the series for either one or two years. At this point in time, Hailey may either produce the pilot and wait for the network's decision or transfer the rights for the pilot and series to a competitor for $100,000. Hailey's decision alternatives and profits (in thousands of dollars) are as follows:

	State of Nature		
Decision Alternative	Reject, s_1	1 Year, s_2	2 Years, s_3
Produce pilot, d_1	-100	50	150
Sell to a competitor, d_2	100	100	100

The probabilities for the states of nature are $P(s_1) = 0.20, P(s_2) = 0.30, and\ P(s_3) = 0.50$. For a consulting fee of $5000, an agency will review the plans for the comedy series and indicate the overall chances of a favorable network reaction to the series. Assume that the agency review will result in a favorable (F) or an unfavorable (U) review and that the following probabilities are relevant.

$P(F\|s_1) = 0.3100$	$P(F\|s_2) = 0.5980$	$P(F\|s_3) = 0.8970$
$P(U\|s_1) = 0.6975$	$P(U\|s_2) = 0.4030$	$P(U\|s_3) = 0.0992$

1. Use Bayes' theorem for probability revision to compute the probability of each agency review and the conditional probability of the Reject s_1, or 1 Year s_2, or 2 Years s_3 given each type of review.
2. Show the decision tree for this problem.
3. What is the optimal decision strategy, and what is the expected profit?

Q: 2 (25 Marks)

The Sabarmati Riverfront Corporation is developing a riverfront community at a privately owned. The primary market for these riverfront lots and homes includes all middle and upper-income families within approximately 100 miles of the development. Sabarmati Riverfront Corporation employed the advertising firm of Mccan Erickson (ME) to design the promotional campaign.

After considering possible advertising media and the market to be covered, ME recommended that the first month's advertising be restricted to five media. At the end of the month, ME will then reevaluate its strategy based on the month's results. ME collected data on the number of potential customers reached, the cost per advertisement, the maximum number of times each medium is available, and the exposure quality rating for each of the five media. The quality rating is measured in terms of an exposure quality unit, a measure of the relative value of one advertisement in each of the media. This measure, based on ME's experience in the advertising business, takes into account factors such as audience demographics (age, income, and education of the audience reached), image presented, and quality of the advertisement. The information collected to date is presented below.

Sabarmati Riverfront Corporation provided ME with an advertising budget of $30,000 for the first month's campaign. In addition, Sabarmati Riverfront Corporation has the following restrictions on how ME may allocate these funds: At least 10 television commercials must be used, at least 50,000 potential customers must be reached, and no more than $18,000 may be spent on television advertisements. What advertising media selection plan should be recommended?

Advertising Media Alternatives for the Sabarmati Riverfront Corporation are shown in the table below:

Advertising Media		Number of Potential Purchase Families Reached	Maximum Cost per Advertisement	Times Available per Month	Expected Exposure Units
1	Daytime TV (1 minute) Station WKLA	1000	$1500	15	65
2	Evening TV (30 seconds) Station WKLA	2000	$3000	10	90
3	Daily newspaper (full page), The Morning Journal	1500	$400	25	40
4	Sunday newspaper magazine (½ page), The Sunday Press	2500	$1000	4	60
5	Radio, 8 AM or 5 PM news (30 seconds) Station KNOP	300	$100	30	20

The maximum number of times the medium is available is either the maximum number of times the advertising medium occurs (e.g., four Sundays per month) or the maximum number of times ME recommends that the medium be used.

Interpret your answer.

Q: 3 (20 Marks)

Fiona stores are interested in understanding how their customers classify them based on their perceptions regarding its products, which is reflected in their store's ratings(1 = above average, 0= below average). To this aim, they have collected data from 200 customers, including their demographic details and purchase patterns. The manager of the store has hired you as a consultant to predict how her new customer would classify the store based on these records. Help her do the classification.

Fiona wants you to do the classification based on their customers' age, gender, (1=male, 0=female), purchase amount in USD, size (0=small size, 1=medium size, 2=large size, 3=extra large size), season (0=fall, 1=winter, 2=spring, 3=summer), shipping type (0=express, 1=free shipping, 2=next day air, 3=standard, 4= 2 day shipping, 5=store pickup), number of previous purchases, payment method (0=cash, 1=Venmo, 2=credit card, 3=PayPal, 4=Bank transfer, 5=Debitcard), and frequency of purchases (0=annually, 1=Bi-weekly, 2=every 3 months, 3=fortnightly, 4=monthly, 5=quarterly, 6=weekly).

Interpret your answer.