THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF MANAGEMENT STUDIES
BACHELOR OF MANAGEMENT STUDIES (HONOURS)
LEVEL: 03
OSU3577: QUANTITATIVE TECHNIQUES FOR MANAGEMENT
FINAL EXAMINATION – 2024/25
DURATION – THREE (03) HOURS

DATE: 20th December 2025 **TIME: 9.30 am – 12.30 pm**

INSTRUCTIONS:

1. **Answer FIVE questions ONLY.**
2. **Use of a non-programmable calculator is allowed.**
3. **All workings pertaining to answers should be properly submitted.**
4. **This question paper contains 7 questions in 6 pages.**

Question 1

a. A person deposits Rs. 270,000 in a bank which offers an annual compounded interest of 8.5%. What is the amount he receives after 8 years? (03 marks)

b. A person deposits Rs 390,000/= in a savings account for which an annual interest rate of 10.5% is paid and if the interest is calculated bi-annually, what is the total amount in his account after 7 years? (03 marks)

c. A government bond pays quarterly compound interest rate of 11%. What is the effective rate of this investment? (03 marks)

d. A businessman needs LKR 250,000 immediately and is comparing two loan offers (A and B). For both loans the borrower receives LKR 250,000 at time 0. The repayment schedules are given in the table below. The rate of discount is 20%. Which loan offer is better for the businessman? Give justifications with your calculations. (11 marks)

Loan	Loan amount	Repayments (LKR)				
		1st Year	2nd Year	3rd Year	4th Year	5th Year
A	250,000	75,000	75,000	75,000	75,000	Nil
B	250,000	Nil	100,000	90,000	80,000	70,000

(Total 20 marks)

Question 2

a. A company wishes to evaluate the quality of 300 products. There are 4 categories of products and the number of products in each category are as follows. The company wishes to study a sample of 150.

Electronic components.....90
Plastic items.....65
Metal items.....40
Packaging items.....105

i. Explain how you pick a stratified sample of 150 products. (05 marks)
ii. Explain how you pick a simple random sample of 150 products. (03 marks)

b. The scores obtained by 20 employees in a workplace skills assessment test are as follows:

65	48	23	51	49	68	62	52	38	59	72	34	48	67	92	84	68	50	82	63

Estimate the following measures for the above data.

i. Mean (02 marks)
ii. Median (02 marks)
iii. Mode (02 marks)
iv. Range (02 marks)
v. Based on the above, comment on the skill level of the employees. (02 marks)
vi. Explain the shape of the distribution of the skill level of the employees based on mean, median and mode you have calculated above. (02 marks)

(Total 20 marks)

Question 3

A retail store has summarized the monthly sales figures for the last 4 years, as shown below.

Monthly sales (Rs.)	Number of months
30,000 upto 35,000	3
35,000 upto 40,000	2
40,000 upto 45,000	3
45,000 upto 50,000	4
50,000 upto 55,000	6
55,000 upto 60,000	8
60,000 upto 65,000	6
65,000 upto 70,000	7
70,000 upto 75,000	5
75,000 upto 80,000	4
Total	**48**

a. Plot the histogram and frequency polygon for the above data. (04 marks)
b. Show the mode of the data in the histogram. (01 mark)
c. Calculate the mean, median, and mode of the sales values. (06 marks)
d. Using the answers given above, determine the shape of the frequency distribution. (01 mark)
e. Plot the less than ogive and mark the median and quartiles on the ogive. (05 marks)
f. Comment on the monthly sales relating to the 48 months given above. (03 marks)

(Total 20 marks)

Question 4

A company is preparing to introduce a new energy drink to the market. The estimated costs (in Rs.) of producing the drink are given below. Based on the performance of similar beverages, the expected revenue function for the new product has also been estimated.

Fixed cost	900
Variable cost per product	X-80
Revenue function	$400 + 20X - X^2$
Production function (K – capital and L – labor)	$6K^3L + 4L^3K$

a. Write a mathematical function for total cost if the number of drinks that can be sold is X. (02 marks)
b. Find the marginal revenue of the drink. (02 marks)
c. Find the profit maximizing output of the drink. (03 marks)
d. Find the marginal effectiveness of capital. (02 marks)
e. Find the breakeven level of production. (03 marks)
f. Find the integral of cost function. (04 marks)
g. Plot the revenue function and cost function in the same graph (where X values range from -2 to 2). (04 marks)

(Total 20 marks)

Question 5

A telecom company wants to analyze how changes in prices have affected the quantities sold of its 5 different data plans. The information collected for the most recent years is shown in the table below:

Data Plan	2022		2023		2024	
	Price (Rs.)	Quantity	Price (Rs.)	Quantity	Price (Rs.)	Quantity
A	400	1250	450	1480	670	1530
B	500	1100	550	1350	780	1460
C	600	980	700	1050	950	950
D	700	720	800	830	1050	880
E	550	1150	600	1250	850	1380

a. Compute the simple **quantity** index for the data plans A, B, and C for years 2024 and 2023 for each item taking year 2022 as the base year. (03 marks)

b. Compute simple aggregate **quantity** index for years 2024 and 2023 taking year 2022 as the base year. Express your opinion on the variations of the index values during the period of 2022 – 2024. (04 marks)

c. When the year 2022 is considered as the base year, compute the Laspeyres **price** index for the years 2023 and 2024. Express your opinion on the variations of the index values during the period of 2022 – 2024. (04 marks)

d. Compute the Fisher's **price** index for years 2024 and 2023, taking year 2022 as the base year. (05 marks)

e. Consider the answers obtained for part (b). If the base year changes to 2023, calculate the new index numbers for years 2022 and 2024. (02 marks)

f. It is claimed that there is an inflationary situation in the economy. Provide evidence to support or deny the claim using the calculated values above. (02 marks)

(Total 20 marks)

Question 6

a. The manager of a fitness center wants to determine whether there is a relationship between members' age groups and their preferred types of fitness activities. A survey was conducted among all registered members, and the responses were classified into the following activity types.

Age level (years)	Fitness activity				Total
	Cardio exercise	Strength training	Yoga	Zumba	
Under 25	8	*2*	(a)	2	17
25-39	11	(b)	2	*10*	32
40-54	8	9	1	*3*	(c)
55 and above	*3*	8	3	(d)	(e)
Total	30	(f)	(g)	16	(h)

i. Find values *(a) – (h)* in above table. (04 marks)
ii. One of the members in the sample was selected randomly. What is the probability that the selected member prefers Yoga? (01 mark)
iii. A randomly selected member was found to be at the age level 40-54 years. What is the probability that the member prefers Strength training? (01 mark)
iv. Find the probability of a randomly selected member prefers Zumba, and is at the age level 25-39 years. (01 mark)

b. A person distributes Rs. 10,000/= among four workers such that the second will have three times as much as the first, the third will have half as much as the second, and the fourth will have Rs. 200/= less than the third. Find the amounts each worker receives separately. (05 marks)

c. In an arithmetic progression, the 4th term is 20. If the sum of the 5th term and the 7th term is 74, find the first term and the common difference. (04 marks)

d. In a geometric progression, the 3^{rd} term is 12 and the 5^{th} term is 48. Find the starting value, common ratio and the sum of first 5 terms. (04 marks)

(Total 20 marks)

Question 7

a. Solve the following equations for X:

i. $7(4x - 3) = 3(5x + 2)$ (03 marks)

ii. $3x^2 - 13 = 4x + 16$ (02 marks)

b. Solve the expression: $1 + (10 - 4^2 \div 5)(-2)^3$ (05 marks)

c. Solve the simultaneous equations: $2X - 5Y = 3$ and $3X + Y = 10$ (05 marks)

d. The sum of three times the salary of a junior assistant and the salary of a senior assistant is Rs. 120,000/=. The difference between the senior assistant's salary and the junior assistant's salary is Rs. 30,000/=. Find the salary of each assistant. (05 marks)

(Total 20 marks)

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Formulae

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} * 100$$

$$Median = L + \frac{\frac{n}{2} - F}{f} * c$$

$$Mode = L + \frac{d_1}{d_1 + d_2} * c$$

$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

$$T_n = \mathrm{ar}^{n-1}$$

$$S_n = \frac{\mathrm{a}(1 - r^n)}{(1 - r)}$$

$$A = \mathrm{p}(1 + \mathrm{i})^n$$

$$A = \mathrm{p}(1 + \frac{\mathrm{i}}{f})^{nf}$$

$$i' = (1 + \frac{\mathrm{i}}{f})^f - 1$$

$$\mathrm{PV} = \frac{\mathrm{A}}{(1 + i)^n}$$

$$\text{Simple Price Index} = \frac{\mathrm{P}_n}{P_0} * 100$$

$$\text{Simple Aggregate Price Index} = \frac{\Sigma \mathrm{P}_n}{\Sigma P_0} * 100$$

$$\text{Weighted Aggregate Price Index} = \frac{\Sigma \mathrm{P}_n Q_x}{\Sigma P_0 Q_x} * 100$$

(When x=0 - Laspeyre's index, When x=n - Paasche's index)

$$\text{Fisher's Price Index} = \sqrt{\frac{\Sigma \mathrm{P}_n Q_0}{\Sigma \mathrm{P}_0 Q_0} * \frac{\Sigma \mathrm{P}_n Q_n}{\Sigma \mathrm{P}_0 Q_n}} * 100$$