UNIVERSITY OF KELANIYA – SRI LANKA

Centre for Distance and Continuing Education

Faculty of Commerce & Management Studies

Bachelor of Commerce (Special) Degree First Year Examination (External) – 2024

April – 2026

BCOM E 1045 - Mathematics for Business

No. of questions: Six (06)

Answer any five (05) questions . **Time: 03 hours**

Question No. 01

a) Define what financial mathematics is by highlighting its practical use in the Banking and Finance sector.

(04 Marks)

b) Simplify following problems

i. $\frac{12x^2y}{8xy^3} - \frac{9x^3}{15x^2y^2} + \frac{6x^2y^4}{18xy^3} - \frac{4y^2}{12x^{-1}y}$

ii. $\frac{\left(3x^{-2}y^3Z^{-4}\right)^2 \times 8\,x^5\,y^{-1}z^{-3}}{(6x^{-3}y^2z)^2 \div 4x^{-1}\,y^3\,z^{-2}}$

(08 Marks)

c) Factorize following expressions.

i. $\frac{4x^2-9}{2x^2+x-6} \div \frac{2x^2-x-3}{3x^2-7x-6}$

ii. A manufacturing company is analysing the budgets of different department to make a report. The Marketing department spends $\frac{2m+7}{m+3}$ of its allocated share on digital campaigns and $\frac{m^2-9}{2m^2+5m-3}$ on print media. Find the difference between the two expenditure fractions and simplify fully, given $m \neq -3$ and $m \neq \frac{1}{2}$

(08 Marks)

(Total Marks 20)

Question No. 02

a) Solve following simultaneous equations.

i. $4a - 3b + 2c = 19$

$3a + 2b - 5c = 1$

$2a + 5b - 3c = 37$

ii. $5p - 2q + 3r = 37$

$2p + 6q - r = 31$

$3p - 4q + 7r = 4$

(06 Marks)

b) At present a manufacturer has 2500 units of a product in stock. This month, the product sells for \$4 a unit. Next month the unit price will increase by \$0.50. The manufacturer wants the total revenue received from the sale of 2500 units to be not less than \$10,750. What is the maximum number of units that can be sold this month?

(06 Marks)

c) Two logistics firms, SwiftCargo and FlexiFreight, charge for daily truck rentals as follows. SwiftCargo charges a flat rate of Rs 20,000 per day with a fuel surcharge of Rs 15 per kilometer driven.

FlexiFreight charges Rs 28,000 per day but includes a corporate fuel subsidy, reducing the per-kilometer charge to Rs 9.

A third firm, BudgetHaul, charges Rs 22,500 per day at Rs 12 per kilometer, but also levies a fixed toll & insurance fee of Rs 3,000 per day regardless of distance.

i. Formulate the total cost equations for each firm.
ii. Determine all pairwise indifference (break-even) kilometer levels.
iii. Construct a decision framework identifying which firm minimizes cost at each kilometer range.
iv. If a client anticipates driving exactly 650 km per day, calculate the cost saving from choosing the optimal firm over the most expensive option.

(08 Marks)

(Total Marks 20)

Question No. 03

a). The first three terms of an arithmetic progression are 4, 9, 14. Find the 45th term of this arithmetic progression.

(04 Marks)

b) Kamala takes a home loan of Rs 3,600,000 and agrees to repay it in 40 monthly installments forming an arithmetic progression, with a first installment of Rs 60,000 and a common difference of Rs 1,500.

After paying the first 20 installments, she has paid 45% of the total loan. She then switches to a new repayment plan for the remaining 20 installments, which also form an arithmetic progression with a common difference of Rs 2,000.

i. Find the total amount paid during the first 20 installments.

ii. Find the remaining balance after the first 20 installments.

iii. Find the value of the first installment in the new payment plan.

iv. Find the value of the last installment in the new payment plan.

(08 Marks)

d) Ruwan invests Rs 50,000 in a savings fund. The fund grows such that each year's value is 1.2 times the previous year's value, forming a geometric progression. After 5 years, Ruwan withdraws 40% of the accumulated value and reinvests the remaining amount into a new fund. The new fund grows at a rate where each year's value is 1.5 times the previous year's value.

i. Find the value of the investment at the end of 5 years in the first fund.

ii. Find the amount reinvested into the new fund after the withdrawal.

iii. Find the value of the new investment at the end of a further 4 years.

(08 Marks)

(Total Marks 20)

Question No: 04

a) Find the firs through the fifth derivatives of the function

$Y = f(x) = 4x^4 - x^3 + 17x^2 + 3x - 1$

(05 Marks)

b) If the total cost function $TC = 100 + 5Q + Q^2$ find fixed cost function and variable cost function.

(04 Marks)

c) If the total cost function $TC = 100 + 10Q + Q^2$ derive the average total cost function.

(04 Marks)

d) Suppose a firm's total cost function is; $TC = 90 + 3Q + Q^2$ find the marginal cost (MC) and calculate MC when $Q = 3$

(04 Marks)

e) If the total cost function $TC = 200 + 5Q + Q^2$ find the profit maximation out when price = 25

(03 Marks)

(Total Marks 20)

Question No: 05

a) Find the solution of the equation system using matrix knowledge.

$5x_1 + 3x_2 = 30$

$6x_1 + 2x_2 = 8$

(04 Marks)

b) Find the inverse of $B = \begin{bmatrix} 4 & 1 & -1 \\ 0 & 3 & 2 \\ 3 & 0 & 7 \end{bmatrix}_{(3X3)}$

(08 Marks)

c) Write the following equation system as AX = B

$7x_1 - 3x_2 - 3x_3 = 7$

$2x_1 + 4x_2 + x_3 = 0$

$-2x_2 - x_3 = 2$

Find the determinant of A.

Does the equation system posses a unique solution.

(08 Marks)

(Total Marks 20)

Question No: 06

a) If the students in a certain class 20 students like Tea (T), 15 students like coffee (C) and 08 students like both. Find the following

i.) Number of students who like either Tea of Coffee.

ii) Number of students who like only Tea

iii) Number of students who like only Coffee

(03 Marks)

b) Let A= { 1, 2 , 3 ,4 , 5 , 6 , 7 }

B= { 2 , 4 , 6 , }

C= { 1, 3 , 5 }

Simplify : (A-B) $\cap$ $[(A - C) \cup B]$

(02 Marks)

c) How many numbers lying between 10 and 100 can be formed with the help of digits 3 ,0 , 4, 5, 6 ?

(03 Marks)

d) How many permutations can be formed by using the following words?

i. ECONOMICS

ii. INTERNATIONAL

(04 Marks)

e) What are the characteristics of binomial expansion ?

(02 Marks)

f) Expand the following expressions by using pascal's triangle ?

i. $(3x + 3)^4$

ii. $(2x - 1)^5$

(06 Marks)

(Total Marks 20)