UNIVERSITY OF KELANIYA – SRI LANKA

Centre for Distance and Continuing Education

Faculty of Commerce & Management Studies

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

April – 2026

BCOM 18045 - 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). Using your knowledge in series. Solve following problems.

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

(04 Marks)

ii. 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.

(a) Find the total amount paid during the first 20 installments.
(b) Find the remaining balance after the first 20 installments.
(c) Find the value of the first installment in the new payment plan.
(d) Find the value of the last installment in the new payment plan.

(08 Marks)

iii. 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.

(a) Find the value of the investment at the end of 5 years in the first fund.
(b) Find the amount reinvested into the new fund after the withdrawal.
(c) Find the value of the new investment at the end of a further 4 years.

(08 Marks)

(Total Marks 20)

Question No: 04

a) Briefly explain the below matrices with one example for each.

i. Row matrix
ii. Diagonal matrix

(03 Marks)

b) Find the Determinant of matrix X.

$$X = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 2 & 8 \\ 6 & 7 & 8 \end{bmatrix}$$

(05 Marks)

c). If $A = \begin{bmatrix} 1 & 3 & 4 \\ 4 & 5 & 6 \\ 5 & 6 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 5 & 1 \\ -4 & 3 & 6 \\ -1 & 0 & 5 \end{bmatrix}$

i. Find $A^T \times B^T$
ii. Find $5A^T + B$

(06 Marks)

d). In a certain factory, a production unit produces three types of smartphones X, Y, and Z. The following matrix shows the number of smartphones sold in two different cities:

$$\begin{bmatrix} 40 & 25 & 15 \\ 30 & 20 & 10 \end{bmatrix}$$

The cost of each smartphone X, Y, Z is Rs. 8,000; Rs. 12,000 and Rs. 15,000 respectively. The selling prices are Rs. 12,000; Rs. 18,000; and Rs. 22,000 respectively. Using matrices knowledge, find the total profit made by the company from both cities.

(06 Marks)

(Total 20 Marks)

Question No: 05

a). Briefly explain the importance of binomial theorem in the real world.

(04 Marks)

b). Find the middle term for $(2 + y)^{10}$

(05 Marks)

c). A school library has recently received new books. There are 5 mathematics books, 4 science books, and 3 literature books. The librarian wants to arrange the books neatly on a shelf. The librarian also wants to select 3 books from the collection to display on a special table. In how many ways can the books be selected?

(05 marks)

d). A company requires its employees to create a 4-digit numeric password using the digits 1, 2, 3, 4, 5, 6, where no digit repeats.

i. How many different passwords are possible?

ii. If the password must start with 1, how many passwords are possible?

(06 Marks)

(Total 20 Marks)

Question No: 06

a) Given $f(x) = \frac{3x+5}{x-1}$, find $f''(4)$

(04 Marks)

b) The below marginal cost function is related to 'ABBA' company. Find the total cost function when the fixed cost is Rs. 1,000.

$MC = Q^2 + 5Q + 100$

(04 Marks)

c) Integrate below.

i. $\int (3x-5)^6\, dx$

ii. $\int_1^5 5x^2\, dx$

(06 Marks)

d) A company produces smartphones, and its total revenue (TR) from selling x units is modeled by the following function:

$TR(x) = 5000x - 2x^2$

The total cost (TC) of producing x units is:

$TC(x) = 1000 + 1000x$

i. Find the marginal revenue (MR) and marginal cost (MC) functions.

ii. Determine the level of production that maximizes profit.

iii. Find the maximum profit.

(06 Marks)

(Total 20 Marks)