



BMGT E 1055 – Mathematics for Business

No of questions – 08

Time: 03 Hours

Answer five (05) questions including question No. One.

(01) (a) Briefly explain the following types of numbers using examples.

(i) Whole numbers

(ii) Natural numbers

(iii) Integers

(iv) Rational number

(v) Irrational numbers

(vi) Real numbers.

(03 marks)

(b) (i) What is an algebraical expression?

(01 marks)

(ii) Simplify the following expression.

$$\frac{x^2 + 2x - 35}{x^2 - 49} \times \frac{x^2 + 7x}{x^2 - 5x}$$

(02 marks)

(iii) When $x^3 + 3x^2 + 3x + c$ is divided by $x - 2$, the remainder is 30. Find the value of c .

(02 marks)

(iv) Solve the following equation by completing square.

$$3x^2 + 8x - 3 = 0$$

(02 marks)

(v) Solve, the following simultaneous equation.

$$x^2 + y^2 = 25$$

$$y - x = 5$$

(02 marks)

(c) Find the factors of the following expressions.

(i) $3(x - 1)^2 - 12$

(ii) $b^4 + 8b$

(iii) $\frac{x^3}{8} - y^3$

(iv) $b^3 + (a - 2b)^3$

(2 marks x 4 = 8 marks).

(Total 20 marks)

(02) (a) Simplify the following expressions with positive indices.

(i) $\frac{(a^2 - 2ab + b^2)^{1/2}}{b^{-1} - a^{-1}} \times \frac{1}{ab}$

(01 marks)

(ii) $a^{-1} + \frac{1}{1 - 2a^{-1}}$

(01 marks)

(b) (i) Find X, if $x^{\sqrt{x}} = (x\sqrt{x})^x$

(02 marks)

(ii) Solve the following equation for, x x.

$$(\sqrt[3]{2})^{2x+7} = (\sqrt[4]{2})^{7x+2/3}$$

(02 marks)

(c) (i) Simplify the following expression.

$$\frac{\log_a 27 + 2 \log_a 3}{\log_a 72 - \log_a 24}$$

(02 marks)

(ii) If $P = \log_{10} 20$ and $q = \log_{10} 25$,

Find x, such that,

$$2 \log_{10} (x + 1) = 2p - q$$

(02 marks)

(d) In a class of 30 students, 15 students have taken Sinhala, 10 students have taken Sinhala but not English. All the students in the class have taken at least one of the subjects of English and Sinhala.

Find the number of students who have taken English but not Sinhala.

(04 marks)

(e) A student is to answer 8 out of 10 questions on an examination.

(i) How many choice has the student?

(ii) How many choice has he, if he must answer the first three questions?

(iii) How many choice has he, if he must answer at least four of the first five questions?

(06 marks)

(Total 20 marks)

(03) (a) (i) Find the equation of straight line with gradient 4 and y - intercept - 3.

(02 marks)

(ii) Find the equation of straight line with gradient -4 passing through (2,8)

(02 marks)

(iii) Find the equation of straight line joining A(-2,3) and B(1,3/2)

(02 marks)

(b) (i) If the point $(x,0)$ is equidistant from the points $(-1,3)$ and $(6,4)$ then what is the value of x ?

(03 marks)

(ii) In what ratio is the line of joint of points $(4, -1)$ and $(5,3)$ divided by the line $x + 3y - 8 = 0$?

(04 marks)

(c) (i) Find the equation of the circle whose center is $(-5, -3)$ and radius is 4.

(03 marks)

(ii) Prove that the two circles

$$x^2 + y^2 + 2x - 6y + 5 = 0 \text{ and}$$

$$x^2 + y^2 + 10x - 2y + 21 = 0 \text{ touch each other externally.}$$

(04 marks)

(Total 20 marks)

(04) (a) Value of a machine after three years of time is Rs. 13629.44. Calculate the rate of depreciation, if its original value was Rs. 20,000.

(06 marks)

(b) A man invested Rs. 10,000 in an account that pays 8.5% interest per year, compounded quarterly. What is the amount of money that he will have his account after 3 years?

(06 marks)

(c) A sum of Rs. 5000 is invested at an interest rate of 9% per year. Find the time required for the money to double if the interest is compounded in semi annually.

(08 marks)

(Total 20 marks)

(05) (a) Given $f(x) = -2x^2 + 1$

(i) Determine $f'(x)$ from first principles.

(06 marks)

(ii) Determine the gradient of the $f(x)$ function at $x = -2$

(02 marks)

(iii) Determine $f(-2)$. What does your answer represent?

(03 marks)

(iv) Determine the average gradient of $f(x)$ between $x = -2$ and $x = 4$.

(03 marks)

(b) Calculate the following limits.

(i) $\lim_{x \rightarrow 1/2} \frac{6x^2 + 7x - 5}{2x - 1}$

(03 marks)

(ii) $\lim_{x \rightarrow 1/3} \frac{6x^2 - 11x + 3}{(3x - 1)(2x - 3/2)}$

(03 marks)

(Total 20 marks)

(06) (a) Differentiate the following functions with respect to x,

(i) $f(x) = \frac{1}{2\sqrt[4]{x^3}}$

(03 marks)

(i) $Y = \left(2\sqrt{x} - \frac{1}{2x}\right)^2$

(03 marks)

(b) The supply equation of a manufacturer is $P = \frac{2q}{100} + 60$ where p is the price in rupees and q is the number of units. The demand per day for this product is 100 units when the price is Rs. 92 per unit and 200 units per day when the price is Rs. 84 per unit.

(i) Determine the demand equation assuming it is linear.

(ii) Find the market equilibrium price and quantity.

(iii) If a tax of Rs. 250 per unit is to be imposed on the manufacturer, how will the original equilibrium price be affected if the demand remains the same.

(iv) Determine the total revenue obtained by the manufacturer at the equilibrium point before and after tax.

(2 marks x 4 = 08 marks)

(c) The demand function of a monopolist market is given by $p = 1500 - 2x - x^2$

(p = price and x = quantity)

Find,

(i) the revenue function

(ii) the marginal revenue function

(iii) the marginal revenue when $x = 20$

(06 marks)

(Total 20 marks)

(07) (a) Integrates the following functions.

(i) $\int \sqrt{x} \left(2 - \frac{5}{x^2}\right) dx$

(02 marks)

(ii) $\int 6x \cdot (3x^2 + 4)^7 \cdot dx$

(02 marks)

(iii) $\int (2x^3 + 1)^4 (6x^2) \cdot dx$ (02 marks)

(b) The marginal revenue function for a product is given by

$$MR = \frac{6}{(x-3)^2} - 4$$

Find, (i) the total revenue function

(ii) the demand function (08 marks)

(c) The demand and supply functions for a product are,

D; $p = \sqrt{124 - 3}$

S $p = q + 2$

(i) Find the consumers' surplus

(ii) Find the producers' surplus (08 marks)

(Total 20 marks)

(08) (a) (i) A man buys every year Bank's cash certificates of value exceeding the last year's purchase by Rs. 3000. After 10 years he finds that the total value of the certificates purchased by him is Rs. 83000. Find the value of the certificate purchased by him in the 8th year.

(05 marks)

(ii) The sum of the first and third terms of the geometric progression is 20 and sum of its first three terms is 26. Find the progression.

(05 marks)

(b) (i) If $A = \begin{pmatrix} 4 & -1 \\ 6 & 9 \end{pmatrix}$ and

$$B = \begin{pmatrix} 0 & 3 \\ 3 & -2 \end{pmatrix}$$

Find, (i) $A + B$

(ii) $2A - B$

(iii) AB

(iv) BA

(v) A' (the transpose of A) (05 marks)

(ii) Using the Cremer's rule solve the following simultaneous equations.

$$4x + 3y - 2z = 7$$

$$x + y = 7$$

$$3x + z = 4$$

(05 marks)

(Total 20 marks)