



University of Kelaniya - Sri Lanka
Centre for Distance and Continuing Education
Faculty of Commerce & Management Studies

Bachelor of Business Management (General) Degree First Examination (External) – 2012/ 13
January/ February - 2016

BMGT E 1055/ BMGT 13055 – Mathematics for Business

No of questions – 08

Time: 03 Hours

Answer any five questions

Use of calculators is allowed

Use of graph papers is prohibited

(01) a) "Mathematics plays an important role in business management." What is the role of Mathematics in Business Management?

(Marks 04)

b) A boy spent 20% of his money and Rs. 50 after it. Then he spent 20% of the remainder. If he had Rs. 1980 left, what was his original money?

(Marks 06)

c) Find the value of x,

$$\text{When } 2^{5x} \times 4^{4x-2} = \frac{8^{3x-8}}{16^{-3x}}$$

(Marks 04)

d) Solve the following equation for x

$$\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = \frac{5}{2}$$

(Marks 06)

(Total 20 marks)

(02) a) In a class test of 70 students, 23 and 30 students passed in Mathematics and statistics respectively. 15 students passed in Mathematics but not passed in statistics. Using set theory, find the number of students

- (i) who passed in both subjects and
- (ii) who did not pass in both subjects.

(Marks 05)

b) From 7 gentlemen and 4 ladies a committee of 5 is to be formed. In how many ways can this be done to include at least one lady?

(Marks 06)

c) Consider the two simultaneous equations below

$$2x + y = 1$$

$$x^2 - 4ky + 5k = 0$$

Where k is a non zero constant.

- (i) Show that $x^2 + 8kx + k = 0$
- (ii) Given that $x^2 + 8kx + k = 0$ has equal roots, find the value of k
- (iii) For this value of k find the solution for the above mentioned two simultaneous equations.

(Marks 09)

(Total 20 marks)

(03) The straight line P_1 has the equation $y = 3x - 6$

The straight line P_2 is,

perpendicular to the line P_1 and passes through the point $(6, 2)$

(i) Find the equation of P_2 in the form $y = mx + c$.

(Marks 05)

(ii) The lines P_1 , and P_2 intersect at the point C .

Use algebra to find the coordinates of C .

(Marks 05)

(iii) The lines P_1 and P_2 cross the x axis at the points A and B respectively.

Calculate the area of the triangle ABC .

(Marks 05)

- b) Show that the two circles $x^2 + y^2 + 4x + 10y = 20$ and $x^2 + y^2 - 8x - 6y = 0$ touch each other externally.

(Marks 05)

(Total 20 marks)

- (04) a) A person borrowed Rs. 10000 at a certain simple interest rate for 2 years. After expiry of one year he borrowed another Rs. 20000 at 1% lower interest rate for 1 year. At the end he paid Rs. 33000. Find the rate of interest at which he borrowed his first loan amount of Rs. 10000.

(Marks 10)

- b) If you deposit Rs. 50,000 in an account that pays 7% annual interest rate, and that compound it monthly, how long it will take for an amount of Rs. 76000 be accumulated in the account?

(Marks 10)

(Total 20 marks)

- (05) a) A mobile phone shop sold 3000 phones in the first month of opening. It is assumed that the number of phones sold would increase by 5% per month.

Calculate,

- (i) The number of phones sold in the 25th month.
(ii) The total number of phones sold over the whole 25 months.
(iii) If the number of phones sold exceeds 30,000 in the Nth month, find N.

(Marks 09)

- b) Given $f(x) = \frac{-1}{4}x^2$

- (i) Determine $f'(x)$ from first principles.
(ii) Determine the gradient of the $f(x)$ function at $x = 4$

(Marks 06)

- c) Calculate the following limit.

$$\lim_{x \rightarrow 4} \frac{3 - \sqrt{x+5}}{x-4}$$

(Marks 05)

(Total 20 marks)

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

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

(ii) $Y = \frac{2x^2 - 3x}{\sqrt{x^2 + 5}}$

(Marks 04)

b) The demand equation of a certain product is, $P(x) = 500 - 0.0125x$, where $P(x)$ is the price in rupees and x , is the quantity demanded.

(i) For what value of x , the revenue becomes maximum?

(ii) What would be the maximum possible revenue?

(iii) What is the selling price per unit that maximize the revenue?

(Marks 08)

c) The production function of a commodity is given by,

$$Q = 40x + 3x^2 - \frac{x^3}{3}$$

(Where Q is the total output and x is the number of units of output)

(i) Find the number of units of output that will give the maximum profit.

(ii) Find the marginal production function and calculate the maximum value of marginal production.

(iii) Show that when the average production is minimum, the average production and marginal production are equal.

(Marks 08)

(Total 20 marks)

(07) a) Integrate the following functions.

(i) $\int \frac{3}{\sqrt{x}} dx$

(ii) $\int 2x(x^2 + 1) dx$

(Marks 04)

b) The demand and supply functions for a commodity are

$$P_d = (6 - q)^2 \quad P_s = 14 - q$$

(Where P_d is the demand price, P_s is the supply price and q is the quantity)

Find the consumers' surplus

(i) When demand and price are determined under pure competition market.

(ii) When demand and price are determined under monopoly market that maximize profit.

(Marks 16)

(Total 20 marks)

- (08) a) A teacher gave three tests to five students. He decided to weight the first and second tests at 20% each and the third at 60%. Following table presents the marks that students have obtained.

	Students	Tests		
		1	2	3
	Mala	75	80	65
	Nimale	85	85	80
	Ranga	70	76	72
	Pradeep	65	65	70
	Shantha	75	76	80

Compute the final averages for the five students using matrix multiplication.

(Marks 08)

- b) (i) Find the determinant of each the following.

(I) $\begin{pmatrix} 1 & 2 & 3 \\ 3 & -1 & 4 \\ 3 & 2 & 1 \end{pmatrix}$

(II) $\begin{pmatrix} 4 & 2 & 2 \\ 25 & -1 & 4 \\ -4 & 2 & -1 \end{pmatrix}$

(III) $\begin{pmatrix} 1 & 4 & 2 \\ 3 & 25 & 4 \\ 3 & -4 & -1 \end{pmatrix}$

(II) $\begin{pmatrix} 1 & 2 & 4 \\ 3 & -1 & 25 \\ 3 & 2 & -4 \end{pmatrix}$

(Marks 04)

- (ii) Using the determinants calculated above, solve the following system of equations.

$$x + 2y + 2z = 4$$

$$3x - y + 4z = 25$$

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

(Marks 08)

(Total 20 marks)