



UNIVERSITY EXAMINATIONS 2013/2014 ACADEMIC YEAR

1ST YEARS EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE

COURSE CODE/ TITLE: BMS 100: MANAGEMENT MATHEMATICS I

END OF SEMESTER I

DURATION: 3 HRS

DAY/TIME: WEDNESDAY 8.00AM – 11.00AM

DATE: 04/12/2013

INSTRUCTIONS:

Answer Question One and any other Two questions

Question One

a) Solve the following linear equations:

i) $\frac{2x + 1}{3} - \frac{2(2x+5)}{5} = 2 + \frac{x-1}{6}$ (3marks)

ii) $\frac{4}{5}(x+5) - 6(2x+3) = \frac{3}{4}(x+14) + 9$ (3marks)

b) Evaluate the following units.

i) $\lim_{X \rightarrow -3} \frac{\sqrt{x+7} - 2}{x+3}$ (4marks)

ii) $\lim_{Xy \rightarrow 2} \frac{x+2}{x^2 + x - 2}$ (3marks)

c) Find the derivatives of the following:

i) $y = \sqrt{x^2} - 1$ (3marks)

ii) $x^2 + xy^2 + y^2 = 2$ (3marks)

d) a company has a large number of typists. A survey shows that 30 can use a word processor, 25 are audio-typists and 28 are shorthand writers. Of the typists who are shorthand writers, 3 are audio typists and can use a word processor, 5 are audio typists and cannot use a word processor, 9 can use a word processor but are not audio typist, 6 of the audio typists can use a word processor but are not shorthand writers.

i) Represent this information on a Venn diagram

ii) How many typists were involved in the survey?

iii) How many typists have only one skill?

e) Evaluate: $\int x \cos x^2 dx$ (3marks)

Question Two

a) A major cosmetic and beauty supply firm, which specializes in a door to door sales approach has found that the response of sales to the allocation of additional sales representatives behaves according to the law of diminishing returns. For one region sales district, the company estimates that annual profit, P stated in hundreds of dollars, is a function of the number of sales representatives X assigned to the district. The function relating the two variables is:

$$P = f(x) = -12.5x^2 + 1,375x - 1500.$$

i) What number of representatives will result in maximum profit for the district? (5marks)

ii) What is the expected maximum profit? (3marks)

b) Solve the logarithmic equation.

$$\ln(x^2 + 2) - \ln(x^2) = 2.$$

(5marks)

c) The population of a country was 100 million in 1970. It has been growing since that time exponentially at a constant rate of 4 per cent per year. The function is given by $P=100C \cdot 1.04^t$.

i) How long will it take for the population to double? (5marks)

ii) Evaluate the projected population for 1995. (2marks)

Question Three

- a) Solve the following systems of linear equations for x, y, z

$$3x + 2y - z = -1$$

$$x + y + z = 6$$

$$3x + y + 2z = 15$$

(15marks)

- b) Evaluate the integrals

i) $\int 2x e^{x^2} dx$

(3marks)

ii) $\int_1^4 [5x - 2 - \frac{32}{x^3}] dx$

(3marks)

- c) The function describing the marginal cost of producing a product is

$$MC = x + 100$$

Where x equals the number of units produced.

The total cost equals \$ 40,000 when x = 100

- i) Determine the total cost function.

(4marks)

- ii) Determine the total cost when 20 units are produced.

(2marks)

Question Four

- a) A company needs to purchase a number of small printing presses of which there are two types, X and Y. Type X costs £ 4000, requires two operators and occupies 20 square meters of floor space. Type Y costs £12,000, also requires two operators but occupies 30 square meters. The company has budgeted for a maximum expenditure on these presses of £ 120,000. The print shop has 480 square meters of available floor space, and work must be provided for at least 24 operators. It is proposed to buy a combination of presses X and Y that will maximize production, given that type X can print 150 sheets per minute and type Y 300 per minute.

You are required to:-

- i) Write down all the equation/ inequalities which represent the cost and space conditions. The labour conditions are given by $2x + 2Y \geq 24$. (3marks)
- ii) Draw a graph to represent this problem, shading any unwanted regions. (4marks)
- iii) Use the graph to find the number of presses X and Y the company should buy to achieve its objective of maximum production. (1mark)

iv) State the figure of maximum production and the total cost of the presses in this case. (2marks)

b) A haulage contractor has estimated that his business can support up to 6 homes and the running cost (in£) per lorry per week are given by:-

$$y = \frac{200}{x} + 110 + 5x, \text{ x is the no. of lorries}$$

i) Plot the graph of above function for relevant values of x. (5marks)

ii) How does the function $200+110+5x^2$ relate to this situation? (1mark)

iii) If the business currently runs 5 lorries, establish their total annual running costs. (2marks)