



FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

MODULE: BASIC MATHEMATICS AND APPLICATIONS IN ECONOMICS AND BUSINESS B – MAEB322

CAMPUS: APK

ASSESSMENT: SUPPLEMENTARY EXAM

DATE: DECEMBER 2014

ASSESSORS: MR W VAN REENEN
MR U KUMBA

INTERNAL MODERATOR: MR RJ MAARTENS

DURATION: 2 HOURS

78

INITIALS AND SURNAME: _____

STUDENT NUMBER: _____

CONTACT NUMBER: _____

NUMBER OF PAGES: 12

INSTRUCTIONS:

ANSWER ALL THE QUESTIONS IN PEN
ALL GRAPHS MUST BE DRAWN IN PEN
NO PENCIL ALLOWED
NO TIPEX ALLOWED
STATE ALL FORMULAS USED, MARKS ARE GIVEN TO FORMULAS
SHOW ALL THE NECCESARY CALCULATIONS
IF NECESSARY ROUND OFF TO TWO DECIMAL PLACES
CALCULATORS ARE ALLOWED

QUESTION 1 [3]

An investment of R300 per month, with the first of 30 payments made in one month's time, matures to Rx after three years. Interest is paid at a rate of 18% per annum, compounded monthly. Determine x .

QUESTION 2 [8]

A hydraulic lifter costs R 550 000 and is expected to have a useful lifetime of eight years. It depreciates at 10% per annum. The cost of a replacement lifter is expected to escalate at 18% per annum. A sinking fund is set up to finance the replacement hydraulic lifter in eight years' time. Find, at the time of purchase of the new hydraulic lifter:

2.1 The scrap value of the old hydraulic lifter. (2)

2.2 The expected cost of a new hydraulic lifter. (2)

2.3 The value that the sinking fund must attain, if the scrap value of the old hydraulic lifter is used to defray expenses. (1)

- 2.4 The value of the monthly instalments that are made into the sinking fund if payments start immediately and end on the day of replacement and the sinking fund earns interest of 12% per annum compounded monthly. (3)

QUESTION 3 [9]

Maximise

$$P = 3x + 2y$$

Subject to

$$x + y \leq 70$$

$$x + 3y \leq 240$$

$$x + 3y \leq 90$$

$$x, y \geq 0$$

QUESTION 4 [4]

Consider a fair die and let

$$A_1 = A_2 = \{1,2,3\} \text{ and } A_3 = \{3,4,5,6\}$$

4.1 Prove that A_1 and A_2 are dependent (2)

4.2 Prove that A_1 , A_2 and A_3 are independent (2)

QUESTION 5 [7]

A fair die is tossed with a fair coin.

5.1 Determine the sample space. (3)

5.1 Find the probability that a head and a 5 show. (2)

5.2 Find the probability that a head and an even number show. (2)

QUESTION 6 [5]

A factory needs two raw materials. The probability of not having an adequate supply of material A is 0.05, where the probability of not having an adequate supply of material B is 0.03. A study determines that the probability of a shortage of both A and B is 0.1. What proportion of the time can the factory operate?

QUESTION 7 [5]

State and prove the Profit Maximisation Theorem.

QUESTION 8 [9]

Determine the slope of the tangent line to each of the following equations, at the point $x = 1$:

8.1 $f(x) = \frac{3x}{\sqrt[3]{x^2}} - 3e^{2x}$ (4)

8.1 $f(x) = 2\ln(4x + 1) \cdot \sqrt{2x - 1}$ (5)

QUESTION 10 [6]

Given $TC = \frac{3}{4}Q^3 + 3Q^2 - 5Q + 11$

Determine

10.1 FC (1)

10.2 VC (1)

10.3 MVC (2)

10.4 AC (2)

QUESTION 11 [4]

Given $AR = 17 - 13Q^2$

Determine

11.1 TR (2)

11.2 MR (2)

QUESTION 12 [18]

Given two demand functions of two different markets, $P_1 = 300 - 2Q_1$ and $P_2 = 80 - 2Q_2$, where both markets share the common total cost function $TC = 2Q + 10$.

If price discrimination is allowed, calculate the maximum profit.

End of Assessment – Total Marks: 78
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Use this page if you want to redo a question. Please indicate clearly at the question that the answer is here.