

UNIVERSITY OF SWAZILAND

FINAL EXAMINATIONS 2007/8

BSc. II

TITLE OF PAPER : ELEMENTARY QUANTITATIVE TECHNIQUES I

COURSE NUMBER : MS 011

TIME ALLOWED : THREE (3) HOURS

INSTRUCTIONS : 1. THIS PAPER CONSISTS OF
SEVEN QUESTIONS.
2. ANSWER ANY FIVE QUESTIONS

SPECIAL REQUIREMENTS : NONE

THIS EXAMINATION PAPER SHOULD NOT BE OPENED UNTIL
PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

QUESTION 1

a) Express as a single fraction in its simplest form

$$\frac{x}{x+1} - \frac{2}{x+3} \quad [6]$$

b) Simplify the expressions

(i) $\frac{y^2 + 3y + xy - 10 - 2x}{y - 2}$ [6]

(ii) $\frac{\sin^2 x - 7 \sin x + 12}{-3 + \sin x}$ [8]

QUESTION 2

a) Factorise the following expressions

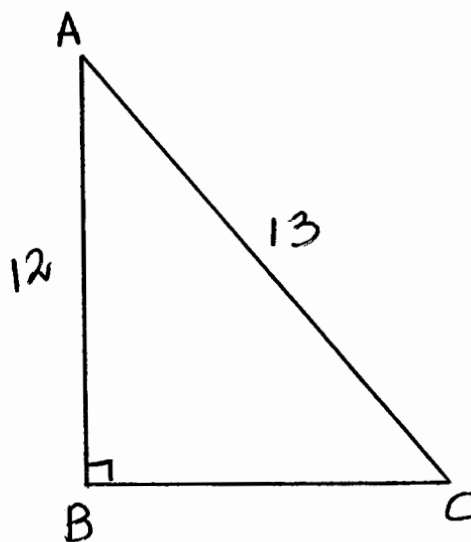
(i) $x^2 - b^2 + x + b$ [6]

(ii) $3m^2x - 4n^2y^2 - 3m^2y^2 + 4n^2x$ [6]

b) Using the triangle ABC, evaluate the following fractions

(i) $\csc \hat{A}CB$ [4]

(ii) $\cot \hat{B}AC$ [4]



QUESTION 3

- a) Given $f(x) = \frac{4x + q}{5x + 3}$, where q is a constant. Find
- (i) q if $f(-2) = 3$ [5]
- (ii) q if $f^{-1}(4) = 7$ [7]
- b) Find the equations of a straight line that is perpendicular to the line $ay + bx = c$ (where a , b and c are constants) and passing through the point $(-2, 7)$. [8]

QUESTION 4

The distance between two towns A and B is 100km. Mr Jones drove from A to B at an average speed of v km/h.

- a) Write down an expression, in terms of v for the time, in hours, that he took to complete the journey from A to B . [3]
- b) on the return journey, his average speed was 6km/hr greater than his speed from A to B .

Write down an expression, in terms of v for

- (i) his speed for the journey from B to A [5]
- (ii) the time, in hours, that he took for the journey from B to A . [5]
- c) Given also that the return journey took 20 minutes less than the journey from A to B , form an equation in v , and show that it reduces to $v^2 + 6v - 1800 = 0$. [7]

QUESTION 5

- a) Use the remainder theorem to find the remainder when $P(x) = 2x^2 - x + 1$ is divided by $x + 2$ [6]
- b) Use long division to find the quotient and remainder when $P(x) = 4x^3 + 2x^2 + x - 1$ is divided by $x - 3$ [10]
- c) Show that $x = -1$ is a root of the polynomial $p(x) = x^3 - x^2 + 2$ [4]

QUESTION 6

a) A student invests E3600 into an account that offers 7% simple interest. How much is in the account after 9 months? [5]

b) Prove the following identities

(i) $(\sin \theta + \cos \theta)(\tan \theta + \cot \theta) \equiv \sec \theta + \csc \theta$ [7]

(ii) $\frac{\cos x}{1 - \tan x} + \frac{\sin x}{1 - \cot x} \equiv \sin x + \cos x$ [8]

QUESTION 7

a) Solve the following logarithmic equations

(i) $2 \log_5 x = \log_5(2x + 3)$ [6]

(ii) $\log_2(2x^2 + 3x + 5) = 3 + \log_2(x + 1)$ [7]

b) After how many years will a principal amount of E5000 double if invested into an account offering 7% interest compounded quarterly? [7]