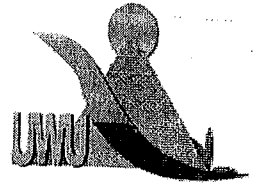


Uva Wellassa University, Sri Lanka
End Semester Examination – February/March 2012
SCT 101-2 / SCT 104-2 Essential Mathematics



Time: Two (02) hours

Total Four (04) questions.
Answer all questions.

01. (i) Derive the usual formula for the solutions to the quadratic equation $ax^2 + bx + c = 0$; $a \neq 0$
- (ii) The product of two consecutive odd integers is 1 less than four times their sum. Find the two integers.
(Hint : Let x be the first odd integer)
- (iii) Find the partial fractions of $\frac{(x+2)(x-2)}{(x-1)(x^2-1)}$

(25 Marks)

02. (i) Solve the equation $\frac{x^2}{2} = 5x - 17$

- (ii) Using solutions in part (i) show that when the roots of a quadratic equation are imaginary (or complex numbers), they always occur in conjugate pairs.
- (iii) In a parallel electronics circuit with two legs, total impedance (Z_T), is given as $Z_T = \frac{Z_1 Z_2}{Z_1 + Z_2}$, where Z_1 , Z_2 and Z_T are complex numbers.

Find the total impedance (Z_T) in the circuit, if $Z_1 = 2 + i$ and $Z_2 = 3 - 5i$.

(25 Marks)

03. (a) (i) Solve $\log_3 x - \log_3 2 = 1 - \log_3(x+5)$

(ii) Solve and Graph $3x(x-1) - 2 \leq 2x(x-1)$

(b) (i) Show, in the usual notation, that ${}^n C_3 = {}^n C_{n-3}$ for $n \geq 3$

(ii) In a club with 4 males and 5 females, how many committees could be chosen with at least 1 but no more than 3 members, regardless of gender?

(30 Marks)

04. (a) (i) Using the binomial theorem show that $\frac{(x+h)^4 - (x-h)^4}{2h} = 4x(x^2 + h^2)$

(ii) Find the middle term of $\left(2 + \frac{1}{x^2}\right)^6$

(b) Prove that $\sin \alpha \cos^3 \alpha + \sin^3 \alpha \cos \alpha = \frac{1}{2} \sin 2\alpha$

(20 Marks)