Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
100 Level 1st Semester Examination –July /August 2016
SCT 101-2 Essential Mathematics

Uva Wellassa University

Instructions to candidates
Duration: 02 hours
Number of questions: 4 Essay Questions
Mark allocation: 100 mark
Use standard symbols without defination.
Scientific calculators are allowed.
Answer all questions

1.

a. Draw the graph of the following function. (10 mark)

$$f(x) = \begin{cases} 2x - 1 \; ; if \; x < 1 \\ 2 \quad\quad ; if \; x \geq 1 \end{cases}$$

b. Simplify the following expression, $\left(\frac{x^3 y^{-2}}{z^6 y^6}\right)^{\frac{1}{6}}$ (5 mark)

c. Solve the following expression for x, $2^{2x-1} = 16$. (5 mark)

d. Solve the following equation for x, $\log_2 4 + \log_2 2 = \log_2 x$. (5 mark)

2.

a. Prove the following Trigonometric identities.

i. $\text{cosec}\, x\,(\cos x + \sin x) = \cot x + 1$ (5 mark)

ii. $\frac{1+\sin x}{\cos x} = \frac{\cos x}{1-\sin x}$ (5 mark)

b. Solve the following inequality and represent the solution obtained on a real line ($\mathbb{R}$). (10 mark)

$$2 \leq 2x - 3 < 10$$

c. Expand $(2x - 1)^6$, by using Binomial theorem. (5 mark)

3.

a.

i. Derive the formula for the solutions to the quadratic equation,

$$ax^2 + bx + c = 0\,; a \neq 0.$$ (10 mark)

ii. Solve, $x^2 - 4x - 21 = 0$. (5 mark)

b. Solve the following expression and find the $Re(z)$ and $Im(z)$. (5 mark)

$$(2 - 3i)\, z = (4 - 5i)\ ; z = x + iy$$

c. Find the modulus of, $(3 - 5i)$. (5 mark)

4.

a. Find the partial fractions of, $\frac{2}{(x+1)(x-1)}$ (10 mark)

b. Let $A = \begin{bmatrix} 1 & 5 \\ -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$. Then find AB. (5 mark)

c. To play a particular card game, each player is dealt five cards from a standard deck of 52 cards. How many different hands are possible? (10 mark)