SCHOOL OF ENGINEERING AND TECHNOLOGY
SPECIAL/SUPPLEMENTARY EXAMS   UNIT CODE: SEB 1101
DATE: 3RD AUGUST 2015
ENGINEERING MATHEMATICS I   CLASS: BC/CB/14D$_3$ TIME: 2 HOURS
INSTRUCTIONS: Answer Question **One (Compulsory)** and any Other **Two** Questions
QUESTION ONE (30 MARKS)

(a) Simplify (without using tables/calculators):
   (i) $log\,125 - log625 + \log 2\,5$
   (ii) $\log 27 - \log 9 + \log 81$ (5 Marks)
(b) Solve the following equation:
$$\log(x - 1) + \log(x + 1) = 2\log(x + 2)$$ (5 Marks)

(c) Solve the following equation correct to 3 significant figures:
$3^{2+x} = 5^{x-1}$ (5 Marks)

(d)   Solve the quadratic equation $4y^2 - 16y + 15 = 0$ by factorization.
           Solve $4x^2 + 4x - 1 = 0$ correct to 2 decimal places by completing the square

                                                                                                  (5 Marks)

(e) Use cramer's rule to solve the system of equations:
$$x - 4y - 2z = 21$$
$$2x + y + 2z = 3$$

$3x + 2y - z = -2$ (5 Marks)

(f) The 4th term of an arithmetical progression is 15, and the sum of the first five terms is 55.
   Find the first term and the common difference, and write down the first five terms.
                                                                                                  (5 Marks)

QUESTION TWO (20 MARKS) OPTIONAL

(a) Simplify each of the following:
   (i) $y^9 x\, y^5$
   (ii) $a^{14} \div a^4$
   (iii) $(w^2)^m \div (w^m)^3$
   (iv) $\dfrac{8x^{-3} x\, 3x^2}{6x^{-4}}$ (5 Marks)

(b) Evaluate without using tables or calculator

$$\frac{log25 - log125 + \frac{1}{2}log625}{3log5} \quad (4\ Marks)$$

(c) Solve the following equation correct to 3 significant figures

$6^{x+1} = 5^{x-4}$ (5 Marks)

(d) Solve the equation $\log_2 x = \log_4(x + 20)$ (6 Marks)

QUESTION THREE (20 MARKS) OPTIONAL

(a) Solve the following quadratic equations by factorization

(i) $x^2 + 7x + 12 = 0$ (1 Mark)

(ii) $6x^2 - 13x + 6 = 0$ (2 Marks)

(iii) $35x^2 - x - 12 = 0$ (2 Marks)

(b) Solve the following quadratic equations correct to 3 significant figures by completing the square

(i) $x^2 + 8x + 5 = 0$

(ii) $4x^2 - 16x + 3 = 0$ (5 Marks)

(c) Solve the cubic equation $x^3 - 2x^2 - 5x + 6 = 0$ by using the factor theorem.

                                                    (5 Marks)

(d) Using the remainder theorem, solve the equation $2x^3 - x^2 - 7x + 6 = 0$.

                                                    (5 Marks)

QUESTION FOUR (20 MARKS) OPTIONAL

(a) Resolve $\frac{8x-28}{x^2-6x+8}$ into partial fractions.   (5 Marks)

(b) The sum of the first three terms of an arithmetical progression is 3, and the sum of the first five terms is 20. Find the first five terms of the progression.   (5 Marks)

(c) Mrs. Prudence deposits 2000 US dollars in a savings account on 1 January each year for 20 years. If the account gives 3% compound interest per annum, what will be the total value of her savings at the end of 20 years? Answer correct to the nearest US dollar.

                                                    (5 marks)

(d)   Obtain the expansion of $(2x + \frac{1}{2})^5$, in descending powers of x.   (5 Marks)

QUESTION FIVE (20 MARKS) OPTIONAL

(a) Use pascal's triangle to obtain the value of $(1.002)^5$, correct to six places of decimals.

                                                    (5 Marks)

(b) Use Cramer's rule to solve the system of equations

$$4x + y - 2z = 0$$

$$2x - 3y + 3z = 9$$

$-6x - 2y + z = 0$ (6 Marks)

(c) Resolve $\frac{2x^2+6x-35}{x^2-x-12}$ into partial fractions.   (9 Marks)