MURANG'A UNIVERSITY COLLEGE

A Constituent College of Jomo Kenyatta University of Agriculture and Technology

School of Pure and Applied Science

SUPPLIMENTALLY EXAMINATION

BUILDING DEPARTMENT

SEB 1101, ENGINEERING MATHEMATICS I

DATE; 1ST JULY 2016 TIME 2HRS

Instructions: Answer question **one** and any other **two**

QUESTION ONE:

i) $\sqrt{54} + \sqrt{150} - \sqrt{24}$ *(3 marks)*

ii) Solve for x and y the equations:

$xy = 80$

$\log x - 2\log y = 1$ *(4 marks)*

iii) Find the remainder when $x^3 - 3x^2 + 6x + 5$ is divided by $x - 2$ *(5 marks)*

iv) Divide:

i) $3x^2 + x - 3$ by $x - 1$ *(3 marks)*

ii) $2x^2 + x^2 + 3x + 5$ by $x + 1$ *(3 marks)*

v) Rationalize and simplify the denomination of the following surds:

$$\frac{3-\sqrt{5}}{1+3\sqrt{5}}$$ *(3 marks)*

vi) Solve the simultaneous equations:

$7x + 2y = 11$

$4x + y = 7$ *(3 marks)*

vii) Solve the simultaneous equations:

$3x + 2y - Z = 19$

$4x - y + 2Z = 4$

$2x + 4y - 5Z = 32$ *(5 marks)*

viii) Solve the quadratic equation:

$x^2 + 5x - 6 = 0$ *(3 marks)*

QUESTION TWO:

a) The 8th term of an AP is 11 and the 15th term is 21. Find the common difference, the first term of series and the nth term. *(5 marks)*

b) The 6th term of a GP is 16 and the 3rd term is 2. Find the 1st term, the common ratio and the nth term. *(5 marks)*

c) In a geometric progression, the sum of the second and third term is 6 and the sum of the third and fourth terms is -12. Find the first term and the common ratio. *(5 marks)*

d) The sum of a number at consecutive terms of an arithmetical progression is -19½ , the first term is 16½ , and the common difference is -3. Find the number of terms. *(5 marks)*

QUESTION THREE:

a) Obtain the first four terms of the expansion $\left(1 + {}^{1}/_{2}\, x\right)^{10}$ in ascending powers of x. Hence, find the value of $(1.005)^{10}$ correct to four decimal places. *(5 marks)*

b) Simplify the following by rationalizing the denominator:

i) $\frac{1}{\sqrt{5}-2} + \frac{1}{\sqrt{5}+2}$ *(3 marks)*

ii) $\frac{2}{\sqrt{7}-\sqrt{3}} + \frac{3}{\sqrt{7}+\sqrt{3}}$ *(4 marks)*

c) Solve the equation: $2^x + 3(2^x) - 4 = 0$ *(4 marks)*

d) Express: $\frac{x^2-3}{(x-1)\,(x^2+1)}$ in partial fractions *(4 marks)*

QUESTION FOUR:

a) Prove by induction that $1^3 + 2^3 + \cdots + n^3 = \frac{1}{4}n^2(n+1)^2$ *(6 marks)*

b) What is the smallest number of terms of the geometrical progression, $8 + 24 + 72 + \cdots$ that will give a total greater than 6,000,000? *(6 marks)*

c) The sum of the first eight terms of an arithmetic progression (AP) is 220. If the third term is 17, find the sum of the first six terms. *(6 marks)*

d) In an arithmetic progression, the 13^{th} term is 27 and the 7^{th} term is three times the second term. Find the 1^{st} term, the common difference and the sum of the first ten terms.
(4 marks)

QUESTION FIVE:

a) Solve the equation: $2x^2 - 3x - 4 = 0$ *(3 marks)*

b) Solve the equations: $5x - 3y - 22 = 31$
$2x + 6y + 32 = 4$
$4x + 2y - 2 = 30$ *(5 marks)*

c) The length of a rectangular room is 4 metres longer than its width. If the area is $12m^2$, find its dimensions. *(5 marks)*

d) Factorize completely: $x^4 - 3x^3 + 4x^2 - 8$ *(4 marks)*

Solve: $x^2 + 8x + 5 = 0$ by method and completing square. *(3 marks)*