(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

Special/supplementary EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: MAT 251

COURSE TITLE: **ENGINEERING MATHEMATICS I**

DATE: 05/02/2021   **TIME:** 8 AM -10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE (30 MARKS)

Evaluate the integrals

(a) $\int_0^1 e^{2x} \cos 3x \, dx$ [7 marks]

(b) $\int \frac{3x-2}{(x+2)(x+3)(x-2)} \, dx$ [8 marks]

(c) Expand $\cos^4 \theta$ by Demoivres theorem   [8 marks]

(d) Determine the Eigen values and the corresponding Eigen vectors of the matrix A

$A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ [7 marks]

QUESTION TWO (20 MARKS)

(a) Expand by Maclaurin's series
  (i) $\ln(1+x)$
  (ii) $\ln(1-x)$
  (iii) $\ln \frac{(1+x)}{(1-x)}$

and hence determine $\ln 4$

         [10 marks]

(b) Determine the Taylor's series expansion of $\sin(x+h)$ up to fourth term and hence determine $\sin 44°$ [10 marks]

QUESTION FOUR QUESTIONS (20 MARKS)

(a) given that $Z_1 = 3 + 2j$, $Z_2 = 4 - 8j$, $Z_3 = 6 + 9j$

    Find (i) $Z_1 + (Z_2 Z_3)$

         [4 marks]

    (ii) $\frac{Z_3}{Z_1}$

         [6 marks]

(b) Expand
  (i) $\cos 5\theta$
  (ii) $\sin 4\theta$ and hence
  (iii) Expand $\tan 5\theta$ by Demoivres theorem

         [10 marks]

QUESTION FOUR (20 MARKS)

Determine the Eigen values and the corresponding Eigen vectors of matrix

$B = \begin{bmatrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{bmatrix}$

QUESTION FIVE (20 MARKS)

(a) Differentiate $cosx$ from the first principles   [6 marks]

(b) $\int xsin^{-1}xdx$ [6 marks]

(c) Determine the Maclaurin's series of sin^2x up to the third term

                                                                    [8mrks]