ELIZADE UNIVERSITY, ILARA-MOKIN,
ONDO STATE, NIGERIA
DEPARTMENT OF AUTOMOTIVE ENGINEERING

FIRST SEMESTER EXAMINATIONS 2018/2019 ACADEMIC SESSION
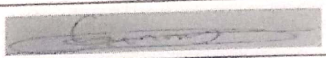
COURSE:	GNE 415 Engineering Analysis	(3 Units)
CLASS:	400 Level General Engineering	
TIME ALLOWED:	3hrs	
INSTRUCTIONS:	Answer Five (5) questions.	**Date:** March, 2019

HOD'S SIGNATURE

Question 1

1a. Show that the real and imaginary parts of the function w = log Z satisfy the Cauchy – Riemann equation when Z is not zero. **5 marks**

b. Find the image and draw a rough sketch of the mapping of the region $1 \leq x \leq 2$ and $2 \leq y \leq 3$ under the mapping $W = e^z$ **7 marks**

Question 2

2a. Find from first principle the Laplace transform of $f(t) = \begin{cases} Cos\left(t - \frac{2\pi}{3}\right), & t > \frac{2\pi}{3} \\ 0, & 0 < t < \frac{2\pi}{3} \end{cases}$ **3 marks**

b. Find the Laplace of $t\ Sinh\ at$ **3 marks**

c. Solve the following differential equation using Laplace Transform

$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 6te^{-t}$ given that y = 0 and $\frac{dy}{dt} = 0$ at t=0 **6 marks**

Question 3

3a. A periodic function $f(t)$ of period $2a$ is defined by $f(t) = \begin{cases} a\ for\ 0 \leq t < a \\ -a\ for\ a \leq t \leq 2a \end{cases}$ show that

$\mathcal{L}\{f(t)\} = \frac{a}{s}\tanh\left(\frac{as}{2}\right)$. Recall that for a periodic function f(t) of period $\alpha > 0$

$\mathcal{L}\{f(t)\} = \frac{1}{1-e^{-s\alpha}}\int_0^{\alpha} e^{-s\alpha} f(t)dt$ **6 marks**

b. Find the inverse Laplace transform of $\frac{3s-1}{(s-3)(s^2+4)}$ **6 marks**

Question 4

4. Find the Fourier transform of the following: (a) $f(t) = \begin{cases} 0, & t < -2 \\ 1, & -2 < t < 2 \\ 0, & 2 < t \end{cases}$ **4 marks**

b. $f(t) = 3\Pi_4(t) + 5\Lambda_4$ **8 marks**

Question 5

5. The masses of 50 ingots in kg are measured correct to the nearest 0.1 kg and the results are as shown below. Produce a frequency distribution having about 7 classes for these data and then present the grouped data as;

8.0	8.6	8.2	7.5	8.0	9.1	8.5	7.6	8.2	7.8
8.3	7.1	8.1	8.3	8.7	7.8	8.7	8.5	8.4	8.5
7.7	8.4	7.9	8.8	7.2	8.1	7.8	8.2	7.7	7.5
8.1	7.4	8.8	8.0	8.4	8.5	8.1	7.3	9.0	8.6
7.4	8.2	8.4	7.7	8.3	8.2	7.9	8.5	7.9	8.0

a develop the cumulative frequency distribution table **5 marks**

b. draw a frequency polygon for the data **3½ marks**

c. draw the ogive curve for the data. **3½ marks**

Question 6

6. The frequency distribution for the value of resistance in ohms of 48 resistors is as shown.

20.5-21.5   3,   22.0-23.5   10,   24.5-25.5   11,

26.0-27.5   13,   28.5-29.5   9,   30.0-31.5   2.

a. Draw a histogram depicting this data and hence determine the mean, median and modal values of the distribution. **8 marks**

b. Calculate the standard deviation from the mean of the resistors, correct to 3 significant figures.

4 marks

Question 7

7. A box contains 74 brass washers, 86 steel washers and 40 aluminium washers. Three washers are drawn at random from the box without replacement.

a. determine the probability that all three are steel washers **2 marks**

b. determine the probability that there are no aluminium washers drawn. **4 marks**

c. find the probability that there are two brass washers and either a steel or aluminium washer

6 marks