189840

Rivers State University, Nkpolu, Port Harcourt
First Semester Examinations
Engineering Mathematics MTH 305

25TH March 2019, Time: 2 Hours
Instruction: Answer four (4) questions

1. (a) Given the differential equation model $dx/dt + 0.7x = 7$, find its steady-state solution provided $x(0) = x_0 > 0$. (b) find the particular solution of question one (1a) if it exists.

2. (a) Given the complex function $Z(x, y) = 2x + iy$, find the real and imaginary parts of Z-2 times the complex conjugate of Z. (b) Calculate the value of the real part for x = 3 of question 2a, (c) Calculate the value of the imaginary part for y =2 of question 2a.

3. (a) Find the Fourier Transform of a rectangular function $f(t) = 1$ that is defined between -0.5 and 0.5. (b) Find the Fourier Transform of a decaying exponential e^{-at} for $t > 0$.

4. Find the general solution of $d^2y/dx^2 - (2/x)dy/dx + (a^2 + 2/x^2)y = 0$.

5. Solve $(1+x^2)\, d^2y/dx^2 - 2x(dy/dx) + 2y = x^3 + 3x$.

RIVERS STATE UNIVERSITY, NKPOLU-OROWORUKWO, PORT HARCOURT.
FIRST SEMESTER EXAMINATION FOR 2019/2020 ACADEMIC SESSION.
DEPARTMENT OF MATHEMATICS.

ENGINEERING MATHEMATIC V (MTH 305)

Attempt any four questions

Time: 2hours **November** 4, 2020.

1. Given that $y(x) = (n^{4x})(n^{-x})$ for $n \neq 0$, find the first degree of sensitivity for
   a. $n = 4, x = 0.167$
   b. $n = 4, x = 0.167$
   c. $n = 4, x = 0.167$

2. Use your sensitivity calculation of question (1) to rank the extension of first degree sensitivity corresponding to the combination of n and x.

3. Given that $\frac{dy}{dt} = \alpha y - \beta y^2$ form $\frac{d^2y}{dt^2}$ in terms of the dependent variable if state without proof any mathematical idea being used without proving it.

4. For the second order ordinary-differential equation $\frac{d^2y}{dt^2} = \alpha\frac{dy}{dt} - 2\beta y\left(\frac{dy}{dt}\right)$. find two possible steady-state solutions. Hence, find the type of stability at the points (4,0) and (0.5, 0).

5. (a) For the steady-state solution $(x_e, y_e) = (12.5\,.\,68.75)$, its calculated eigenvalues are 0.125 and -0.68. is this steady-state solution stable or unstable as $t \to \infty$.

   (b) Verity that the chosen steady- state solution is satisfy

Examiner
Prof. E. N. Ekaka-a

DEPARTMENT MATHEMATICS
RIVERS STATE UNIVERSITY, PORT HARCOURT
FIRST SEMESTER EXAMINATION FOR 2020/2021 ACADEMIC SESSION

COMPLEX VARIABLES (MTH 305) **Time: 2hours**

Instruction: Answer any four (4) question

1. (a) State without prove the Cauchy integral formula. Hence, evaluate $\int \frac{\cos \pi z^2}{(z-1)(z-2)^2} dz$ where C is $|z| = 3$.
   (b) Evaluate $\int_0^{1+i} (x^2 - iy)dz$ along the path
   (i) $y = x$ (ii) $y = x^2$

2. (a) Expand $f(x) = \frac{e^{2z}}{(z-3)^4}$ in Laurent series about the point $z = 3$
   (b) State and Prove the Residue theorem

3. (a)Find the two half-range expansion of the function

$$f(x) = \begin{cases} \frac{2k}{l}x & if \quad 0 < x < \frac{l}{2} \\ \frac{2k}{l}(l-x) & if \quad \frac{l}{2} < x < l \end{cases}$$

   (b) Find the complex fourier series corresponding to the function $f(x) = e^{-2x}$ over $(-3, 3)$, $f(x+6) = f(x)$.

4. (a) Evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$

   (b) In the function $f(z) = \phi + i\psi$, where $f(z)$ is analytic.
   If $\phi = x^2 + 4x - y^2 + 2y$, find ψ and write $f(z)$.

5. (a) Solve the constant coefficient equation by the Laplace transform method $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 8y = \cos 2x, y(0) = 2$ and $\frac{dy}{dx} = 1$

   (b) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{3x}, y(0) = 0, \frac{dy}{dx} = 0$

6. (a) Given that $y(x) = 2^x$, form $\frac{dy}{dx}$ and calculate the sensitivity function of the first degree for $x = 0:1:3$, hence calculate the sensitivity function of the second degree for $x = 0:1:3$

   (b) If $\frac{dy}{dt} = 0.6 - 0.01y, y(0) = 40$. Calculate its steady-state solution, hence determine the unique positive equilibrium value for the generalized ODE $\frac{dy}{dt} = a - by^{1.5}, y(0) = 40$ provided the model parameter values a and b are positive constants.

DEPARTMENT OF MATHEMATICS
River State University, Nigeria

July 1, 2022

Time: 2 Hours. **MTH 305 - Engineering Mathematics V**

Attempt Any Four Questions. Each Question Carries 17.5 Marks.

1. (a) State the Cauchy integral theorem and Cauchy integral formula, hence evaluate

$$\oint_C \frac{z^4 + 3z^2 - 3}{(z-1)^3}\, dz$$

if C is a simple closed curve that encloses all the singular points.

(b) Find the Laurent series expansion for $f(z) = \frac{z}{(z+1)(z+4)}$ valid for $|z| < 3$.

[17.5 marks]

2. Evaluate the integral $\int_0^{3+i} z^2\, dz$ along

(a) the line $y = x/3$,

(b) the parabola $x = 3y^2$.

[17.5 marks]

3. (a) Show that the function $f(z) = e^{2z}$ is analytic and each of the real and imaginary parts satisfies the Laplace equation.

(b) Find the residues of

$$f(z) = \frac{z+1}{z^2(z-1)(z+2)},$$

hence evaluate $\oint_C f(z)\, dz$ where C is a simple closed curve enclosing all the poles.

[17.5 marks]

4. Find the Fourier series expansion for the function defined by $f(x) = 2x, 0 < x < 2\pi$ such that $f(x + 2\pi) = f(x)$.

[17.5 marks]

5. (a) Show that the functions, $1, \cos(\pi x), \cos(2\pi x), \cos(3\pi x), \cdots$, form an orthogonal set in $(-1, 1)$.

(b) Find the complex Fourier series corresponding to the function defined as $f(x) = e^{-2x}$ for $x \in (-3, 3), f(x + 6) = f(x)$.

[17.5 marks]

6. (a) Find the Laplace transform of (i) $f(x) = e^{5x}\cos(6x)$, (ii) $f(x) = e^{-2x}\sinh(3x)$.

(b) Find the inverse Laplace transform of $F(s) = \frac{4}{(s+4)^2} + \frac{s}{(s+4)^2 - 3}$.

(c) Using the Laplace transform methods, find the solution of the following initial value problem:

$$\frac{d^2y}{dx^2} + y = e^{2x},$$

$$y(0) = 0, \quad \left.\frac{dy}{dx}\right|_{x=0} = 0.$$

[17.5 marks]

Department of Mathematics (Examiner)

We wish you all the best of luck.

RIVERS STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY
NKPOLU-OROWORUKWO, PORT HARCOURT
FIRST SEMESTER EXAMINATION 2016/2017 SESSION
CMS 211: Computer Programming for ChemPet and Petroleum Engineering

INSTRUCTION: (1) Answer any four questions.
(2)Provide the algorithm and flowchart for all answered questions.TIME: 2 HOURS

1. Write a program that reads in a matrix, A, of order n x m and determine its transpose. The transpose of a matrix is an m x n matrix where the columns are the rows of A and the rows are the columns from A. Example:

$$A = \begin{matrix} 12 & 5 & 2 \\ 1 & 2 & 3 \end{matrix} \qquad TRANS(A) = \begin{matrix} 12 & 1 \\ 5 & 2 \\ 2 & 3 \end{matrix}$$

2. Write a program to find the angle, α, between the two vectors, F^1 and F^2 with the formula

$$\cos(\alpha) = \frac{F^1 \cdot F^2}{|F^1||F^2|}$$

Where $F^1.F^2$ = DOT product of the two vectors

$|F^1|$ = magnitude of $\bar{F}^1 = [(F^1x)^2 + (F^1y)^2 + (F^1z)^2]^{1/2}$

3. Write a program to read in values for a, b, and, c, and print their sum. Repeat this procedure until all values of a, b, and c are negative.
4. Write a program to read in the radius r of a circle centred at the origin. The read in coordinate pair (x,y) of a point and determine if that point lies within the circle or outside the circle. The point is within the circle if:

$$(x^2 + y^2)^{1/2} < r$$

5. A gas pipeline with a given length and diameter transports a natural gas with a specific gravity of 0.7 from Station A at a certain pressure to Station B at another pressure. Write a program to evaluate the pipeline flow capacity and ~~gas velocity inside the pipeline.~~

Pipeline wall roughness, ε
Base temperature, T_{sc}
Base pressure, P_{sc}
Gas average temperature, $\overline{T}$
Gas viscosity, μ
Gas average deviation factor, $\overline{z}$

Note: Pipeline flow capacity equations:

$$q = \frac{1.149 \times 10^6 T_{sc}}{P_{sc}} \left[\frac{P_1^2 - P_2^2}{\gamma_g \overline{T} \overline{z} L}\right]^{0.5} d^{2.5}$$

Where T in K, d in m, L in m, q in m^3/day

$$N_{RC} = \frac{17.96 \gamma_g q}{\mu d}$$

Where q is in standard m^3/day, γ_g is the gas specific gravity (air = 1), d is diameter in m, μ is gas viscosity in $P_a - sec$.

6. The index of refraction ng is the ratio of the speed of light in vacuum to the speed of light in glass. At an interface between glass and vacuum, a ray of light travelling at angle θv in the vacuum will be bent as it enters the glass at an angle θg.

According to Snell's law, these angles are related by $\sin(\theta v) = ng \sin(\theta g)$. Write a program to estimate the index of refraction based on input angle of incident ray of light and a refracted ray of light.

DEPARTMENT OF COMPUTER SCIENCE
FIRST SEMESTER 2017/2018 EXAMINATIONS

CMS 211 – Computer Programming
Instructions: Answer ALL questions in SECTION A and any THREE Questions from SECTION B.
PLEASE WRITE CLEARLY

Time allowed: 2 hours

SECTION B

ANSWER ANY THREE QUESTIONS FROM THIS SECTION

1a. Why does C++ require programmers to declare a variable before using it? What are the advantages of declaring variables?

1b. Suppose the following scheme is used for assigning grades in a course

Score	Letter Grade
70-100	A
60-69	B
50-59	C
45-49	D
40-44	E
0-39	F

Develop an algorithm and write a C++ program, using (nested) If statement, that will print the grade for a supplied value of score. The program prints a warning message for values of scores that are less than zero (0) or greater than 100.

2. Given the following array declarations:

```
int collection[30];
int x[] = {0, 2, 4, 6, 8, 5};
float x[7] = {20.5, 4.5, 13.03, 22.15, 14.7, 1.8, 12.08};
char weather[6][10]= {"cloudy", "cold", "sunny", "hot", "warm", "overcast"};
```

a. How many elements does collection hold? What does the expression collection[15] represent?
b. What would be the value of weather[3] (i) weather[5][2]?
c. Write separate C++ program statement(s) to accomplish the following tasks:
   i. Take second element from the array x and assign the value to height variable
   ii. Add the third and sixth elements of x
   iii. Determine and print the average of the elements in x
   iv. Find and print the largest and smallest values in x

3a. Suppose we have the following variable declarations in our program:

```
int x, y, z, m, n;
double u, v, w;
```

Assume that the current values of these variables are x=10, y=3, z=5, m=6, n=8. Compute the value of each of the following expressions.

i. --x%y*z+--x---y+n;
ii. x+= % --y +7//z;
iii. x+=y+z%2*n;
iv. !(m != n && (n%2-r%2))

b. Develop an algorithm and write a C++ program to find the largest and smallest numbers in an unordered set of numbers.

4a. What is a loop? State two main differences between a do.. while loop and a while loop. Write simple code to illustrate the differences.

4b. Suppose that the following code fragment is executed.

```
const int LENGTH = 21;
char message[LENGTH];
cout << "Enter a sentence on the line below." << endl;
cin >> message;
cout << message << endl;
```

do
{ Statement }
while (condition).

while (condition)
{ Statement }

i. What will the output look like if the user types the following line and presses Enter:

Please go away.

ii. Suppose that the statement "cin >> message;" is replaced by the statement

cin.getline(message, LENGTH, '\n');

What will the *output* look like if the user types the following line and presses Enter? Give reason for your answer.

1. *Please go away.*
2. *Please stop bothering me.*

5a. High level languages are problem-oriented. Discuss

5b. Find and correct the errors, if any, in each of the following statements.

i.
```
if ( a>=0)
  a+=1;
  cout<<"the value a is"<<endl;
else
cout<<"the value of a not incremented"<<endl;
```

ii.
```
# include <iostream>
      int main ( )
      {// prints " Hello. World! " : cout <<
"Hello, World ! / n";}
```

iii.
```
sum =0.0
denom=1.0;
while (denom <=10.0) {
sum=sum+1/denom;
denom=denom+1.0;
}
```

iv.
```
for(counter = 1; counter !=10; counter++)
      {
            sum +=counter;
      {
```

In a;
Cout<< Name
Cin>> a;

Rivers State University, Port Harcourt, Faculty of Science
Department of Computer Science
First Semester 2018/2019 Examination

CMS 211 – Computer Programming (Mechanical Engineering, Agric Engineering & FTSE) Time Allowed: **2 Hours**

Instructions: Answer any five questions. All questions carry equal marks.

1. a. What is concatenation?
   b. Write a program in C++ that accepts your first name, last name and address as inputs, concatenates them and prints the new string on screen.

2. a. Differentiate between an algorithm and a computer program.
   b. Write an algorithm and a flowchart to find the area of a rectangle.
   c. Based on the algorithm above, write a program to compute the area of a rectangle. The program should accept as input the dimensions of the rectangle (i.e., length and width). The formula for the area of a rectangle is: *Area = Length * Width*

3. a. What is a comment?
   b. What are the benefits of using comments?
   c. Using two examples, show the two ways in which comments can be written in C++.

4. John needs to create circles in a field for an experiment. Each circle will have a diameter of 25. The formula to calculate the circumference of a circle is $2\pi r$. $\pi = 3.14$. Write a program in C++ to calculate the circumference of the circles. The program should also output the radius of the circle.

5. a. What is a variable?
   b. James has been asked to develop a program that will hold data on students of his department. He has come up with variable names for his program. Please identify the incorrect variable names below and suggest correct alternatives.

i. First Name	ii. lastName	iii. middle name	iv. DOB	v. phone number
vi. 2nd phone umber	vii. department	viii. LEVEL	ix. my weight	x. myHeight

6. Write a program in C++ that:
   - loops through the numbers 1 – 100
   - if the number is divisible by 3, print "Fizz"
   - if the number is divisible by 5, print "Buzz"
   - if the number is divisible by both 3 & 5, print "FizzBuzz"
   - if the number is not divisible by 3 or 5, print the number

7. Suppose the following object definitions are in effect:
   bool P = true; bool Q = true; bool R = false; int i = 2; int j = 3;
   Evaluate the following expressions:
   a. (i != 0) && (j/i) > 6)
   b. (j%i == 0) || (Q && R)
   c. P && Q || !P && !Q
   d. P || Q && !P || !Q
   e. P && (Q || R)

RIVERS STATE UNIVERSITY, NKPOLU-OROWORUKWO, PORT HARCOURT.
DEPARTMENT OF COMPUTER SCIENCE
FIRST SEMESTER EXAMINATION, 2021/2022 ACADEMIC SESSION
CMS 211 – Computers Programming I

TIME ALLOWED: 2 Hours

DATE: 28th June, 2022.

SECTION A (45 Marks) – Equal Marks to all questions

INSTRUCTIONS: Answer **any three** questions from **section A** in your answer booklet and **section B** in the space provided on the question paper. **Keep out of the exam hall** mobile/smart phones and held devices.

Q1. (a) Distinguish between the break and continue statements when executes in control structures.
Consider the following program segments A and B respectively:

```
for(int x=1;x<=11;x++){
  if (x==6 or x==9)
    continue;
  cout<< x;}
```

```
for(int x=1;x<=11;x++){
  if (x==6 or x==9)
    break;
  cout<< x;}
```

Discuss the two program segments with respect to the use of continue and break statements, and state their outputs.

(b) (i) With appropriate examples, distinguish between the declaration and definition of an identifier.
(ii) Why are remarks used in a program? How would you include remarks in a C++ program?

Q2. (a) Using a ***do…while*** statement, write a C++ program that will read in an arbitrary number of positive input values, calculate and print the harmonic mean of the numbers. Harmonic mean = $\frac{N}{\frac{1}{X_1}+\frac{1}{X_2}+\frac{1}{X_3}+\cdots+\frac{1}{X_n}}$.

(b) Draw a flowchart that will determine and display if a given natural number (**n**) is a prime number or not.

Q3. (a) The gravitational force F between two bodies of masses m_1 and m_2 is given as : $F = \frac{Gm_1m_2}{r^2}$
Where G is the gravitational constant (6.672×10^{-11} N.m²/kg), m_1 and m_2 are masses of bodies in kilograms, r is the distance between the two bodies. Write a C++ function to calculate the gravitational force between the two bodies. Test your function by determining the force on 1000kg satellite in orbit 38,000 km above the Earth. (The mass of the Earth is 5.98×10^{24} kg).

(b)(i) Using appropriate examples distinguish between call by value and call by reference parameter passing techniques.
(ii) With appropriate examples explain what preprocessor directives are and why they are important in a C++ program.

Q4. (a) Draw a flowchart to compute and print X^n given that $X^n = X * X_{n-1} * X_{n-2} * X_{n-3} * \ldots * X_1$.

(b) Given an array called **array (n,n)**, write a C++ program to compute the sum of the leading diagonal elements as ***diagSum***, upper triangular elements as ***uppSum*** and lower triangular elements as ***lowSum***. The program should display the *diagSum*, *uppSum* and *lowSum*.

Q5. (a) Engineers often measure the ratio of two power measurement in decibels, or dB. The equation for the ratio of two power measurements in decibels is given as: $dB = log_{10}\frac{P_1}{P_2}$
Where P_2 is the power level being measured, and P_1 is some reference power level. Assume that the reference power level is one watt. Write a C++ program that calculates the decibel level corresponding to power level between 1 to 20 watts, in 0.5 watt step.

(b) (i) The total resistance of n resistors in parallel is given as : $\frac{1}{R} = \frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\ldots+\frac{1}{R_n}$. Write a C++ function Main() code segment to compute the total resistance for any number of resistors in parallel.

(ii) In not more than three sentences, differentiate between logically-controlled and counter-controlled loop structures in C++.

SECTION B (25 Marks)

INSTRUCTIONS: Answer section B on the question paper ***using pen only***. Cancellation of answers in this section attracts a negative mark (i.e. -1).

1. Programmers refer to the items needed to reach a problem's goal as the .....
2. The compiler converts your C++ instructions into .....
3. The creation of a variable by specifying its name and type is called .....
4. The statement ..... will store the letter H in a variable named initial.
5. The ..... symbol is used to represented an extractor operator in C++.
6. The expression 2+4/2+5*4 -2 results to .....
7. The most efficient data type for a variable that stores the number 20000 is the ..... type.
8. The concise code like statements that represents the steps the computer need to follow in solving a problem is called .....
9. The syntax of a block comment in C++ is given as .....
10. Evaluation of the expression 3>6 && 7>4 yields .....
11. To use one of the C++ inbuilt mathematical functions you must write ..... directive.
12. The items listed in the function header are known as .....
13. The last statement in a value returning function is .....
14. Identifiers known only to the function in which they are declared are called ..... variable.
15. The fourth step of problem-solving is called .....
16. The syntax of the standard output statement in C++ is given as .....
17. The do...while loop is referred to as a..... because the loop condition is tested after the loop instructions are processed the first time.
18. When you pass a variable ....., C++ passes the address of the variable to the receiving function.
19. Coercion refers to ..... type conversion.
20. Every C++ program must have at least one function known as .....
21. Elements of an array are identified by a unique .....
22. You declare a function with a function .....
23. Write a while clause that will stop the loop when the value in a variable age is zero or less.....
24. The expression that form the condition in the if statement is always .....
25. The ..... object is said to be attached to a standard input device like the keyboard.

!!BEST WISHES!!

RIVERS STATE UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

CONTINUOUS ASSESSMENT FOR ELECTRICAL PROPERTIES OF MATERIAL (EEE 301)

1) a. What is a dielectric material?
   b. Explain the term polarization and mention the types of polarization mechanism you know
   c. A parallel plate capacitor with dimensions of 38mm by 65mm and a plate separation of 1.3mm must have a minimum capacitance of 70pF when an A.C potential of 1000V is applied at a frequency of 1MHz. Determine the dielectric constant of the material.
2) Discuss the effect of temperature variation on the following materials:
   i. Conductors
   ii. Insulators
   iii. Semi – conductors
3) a. What is Conductivity?
   b. What are the factors affecting the resistivity of electrical materials?
   c. Find the conductivity of a Lincoln wire when you have the following parameters. 1m length of lincoln wire, $1mm^2$ cross sectional area, a current of 4A and a voltage of 12V
4) a. Briefly discuss the concept of material science
   b. What is the different between material science and material engineering?
   c. Write the electronic configuration of neon
5) a. What did you understand by superconductivity?
   b. List and describe types of superconductivity and give example of each?
   c. What is transition temperature in superconductivity and the Effect of Magnetic Field on Superconductivity?
6) a. What did you understand about semiconductor materials and with a chat classify semiconductor materials.
   b. with the aid of a diagram describe the charge contains in a P-type semiconductor material and define the function of a P-N junction diode?
   c. with the aid of a diagram describe when a diode Forward and Reverse characteristic?
7) a. what did you understand by Absolute and Relative permeabilities of a medium?
   b. A toroid has $\mu_r = 750$ and is wound with 500 turns of copper wire carrying a current of 2A. it has a cross -sectional area of $3 \times 10^{-3}m2$ and a mean radius of 150mm. find the magnetic field, the magnetic flux, the magnetization and the flux density in the core

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of Technology (B. Tech): Year III **DATE: 05/11/2020**

Examination Paper: EEE 301. (Electrical Properties of Materials)

No. of Students: 200

2019/2020 Session – 1st Semester **Time Allowed: 2hrs**

Lecturers: Engr. Dr. S. A. Bruce-Alison; Engr. L. Dumkhana and Mr. B. Deesor,

Max. Mark: 70%

Instruction: Answer Four Questions at Least One Question in each Section and the Remaining one Question from any of the Sections' Unanswered Questions.

All questions carry equal marks

Switch off all phones and keep them out of sight. Do not write anything except your matriculation number on the question paper. Only scientific calculator is allowed

Section A

1) (a) What is a dielectric material? (2Mrks)
   (b) Explain the term polarization and mention the types of polarization mechanism you know? (7Mrks)
   (c) A parallel plate capacitor with dimensions of 38mm by 65mm and a plate separation of 1.3mm must have a minimum capacitance of 70pF when an AC potential of 1000V is applied at a frequency of 1MHz. Determine the dielectric constant of the material. (7.5Mrks)
2) Discuss the effect of temperature variation on the following materials:
   (a) Conductors (6Mrks)
   (b) Insulators (6Mrks)
   (c) Semi – conductors (5.5Mrks)

Section B

3) (a) What is Conductivity? (2Mrks)
   (b)What are the factors affecting the resistivity of electrical materials? (7Mrks)
   (c) Find the conductivity of a Lincoln wire when you have the following parameters. 1m length of Lincoln wire, $1mm^2$ cross sectional area, a current of 4A and a voltage of 12V (8.5Mrks)
4) (a) Briefly discuss the concept of material science? (6Mrks)
   (b)What is the different between material science and material engineering? (7.5Mrks)
   (c)Write the electronic configuration of neon? (4Mrks)

Section C

5)(a) What do you understand by superconductivity? (2Mrks)
   (b) List and describe types of superconductivity and give example of each? (8.5Mrks)
   (c) What is transition temperature in superconductivity and the Effect of Magnetic Field on Superconductivity? (7Mrks)
6) (a) What do you understand by Absolute and Relative permeability of a medium? (4Mrks)
   (b) A toroid has $\mu_r = 750$ and is wound with 500 turns of copper wire carrying a current of 2A. it has a cross-sectional area of 3×10^{-3}m2 and a mean radius of 150mm. find the magnetic field, the magnetic flux, the magnetization and the flux density in the core. (7.5Mrks)
   (c) What is a semiconductor material and with a chat classify semiconductor materials (4Mrks)

RIVERS STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY,
NKPOLU-ORO-WORUKOPORT HARCORT
DEPARTMENT OF ELECTRICAL ENGINEERING. BACHEOR OF TECHNOLOGY (B. TECH) YEAR 3
EXAMINATION QUESTION PAPER: EEE 301 (ELECTRICAL PROPERTIES OF MATERIALS)
2020/2021 SESSION: 1ST SEMESTER
DATE: 22-03-2019
LECTURERS: Engr. Dr. S.A. Bruce-Allison, Engr. L. Dumkhana and Mr. B. Deesor TIME ALLOWED: 2 Hours
INSTRUCTION: **Answer *any 4 Questions, at least 1 from each section***
All Questions carry equal mark MAX. MARK: 70%

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. Only scientific calculator is allowed

Section A

Q1. (a) What are the main classes of engineering materials?
(b) State the properties of a material that makes it suitable to be used as (i) a dielectric, (ii) an insulator and (iii) a conductor.
(c) Give two examples of each of the materials in (a) above
(d) State the uses of these materials in electrical applications

Q.2 (a) What is a dielectric material? How is it different from an insulator?
(b) Define the following terms: (i) polarization, (ii) dielectric loss (iii) electrostriction (iv) break down voltage
(c) Explain how the charge storing capacity is increased by the insertion of a dielectric material within the plates of a capacitor.
(d) A charge of 3.5×10^{-11} C is to be stored on each plate of parallel plate capacitor having an area of $160mm^2$ and a plate Separation of 3.5mm (i) what voltage is required if a material having a dielectric constant of 5.0 is positioned within the plates. (ii). what voltage would be required if a vacuum is used.

Section B

Q3. (a) Briefly explain the following terms: scattering, drift velocity and mobility of free electron
(b) Calculate the drift velocity of a material whose mobility of electron is 0.38 m^2 N-s and when the magnitude of electric field is 1000 Vm^{-1}
(c) Under these circumstances, how long does it take an electron to traverse a 25mm length of the material?

Q4 (a) Compare the temperature dependence of the conductivity for metals and semi-conductors.
(b) Discuss the factors that contribute to the electrical resistivity of a metal.
(b) Briefly state the main differences between ionic, covalent and metallic bonding
(c) A cylindrical metal wire 3 mm in diameter is required to carry a current of 12 A with a minimum of0.01 V drop 300 mm of wire. Determine the electrical conductivity of the metal

SectionC

Q5. (a) What do you understand by superconductivity?
(b) List and describe types of superconductivity and give example of each?
(c) What is transition temperature in superconductivity and the Effect of Magnetic Field on Superconductivity?
(d) What is a semiconductor material and with a chat classify semiconductor materials.

Q6. (a) What do you understand by Absolute and Relative permeability of a medium?
(b) A toroid has $\mu_r = 750$ and is wound with 500 turns of copper wire carrying a current of 2A. it has a cross-sectional area of 3×10^{-3}m2 and a mean radius of 150mm. find the magnetic field, the magnetic flux, the magnetization and the flux density in the core.
(c) Define the following term (i) Magnetic field strength, (ii) Magnetic potential, (iii) Magnetic susceptibility (iv) Magnetization, (v) Permeability

Test on EEE 301. (Electrical Properties of Materials) **Date: 03/06/2022**

1) (a) What is a dielectric material?
   (d) Explain the term polarization and mention the types of polarization mechanism you know?
   (e) A parallel plate capacitor with dimensions of 38mm by 65mm and a plate separation of 1.3mm must have a minimum capacitance of 70pF when an AC potential of 1000V is applied at a frequency of 1MHz. Determine the dielectric constant of the material.
2) Discuss the effect of temperature variation on the following materials:
   (d) Conductors
   (e) Insulators
   (f) Semi – conductors
3)(a) What do you understand by superconductivity?
   (b) List and describe types of superconductivity and give example of each?
   (c) What is transition temperature in superconductivity and the Effect of Magnetic Field on Superconductivity?
4) (a) What do you understand by Absolute and Relative permeability of a medium?
   (b) A toroid has relative permeability of 750and is wound with 500 turns of copper wire carrying a current of 2A. it has a cross-sectional area of $3 \times 10^{-3}m^2$ and a mean radius of 150mm. find the magnetic field, the magnetic flux, the magnetization and the flux density in the core.
   (c) What is a semiconductor material and with a chat classify semiconductor materials.
5) (a) What is a Magnetic and Magnetic field,
   (b) what is the different between natural and artificial magnets.
   (c) Describe two properties of magnets you know?

RIVERS STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY,
NKPOLU-ORO-WORUKOPORT HARCORT

DEPARTMENT OF ELECTRICAL ENGINEERING. BACHEOR OF TECHNOLOGY **(B. TECH)** YEAR 3
EXAMINATION QUESTION PAPER: **EEE 301 (ELECTRICAL PROPERTIES OF MATERIALS)**
ELECTURERS: Engr. Dr. S.A. Bruce-Allison, Engr. L. Dumkhana and Mr. B. Deesor **TIME ALLOWED: 2 Hours**
INSTRUCTION: **Answer *any 4 Questions, at least 1 from each section***
All Questions carry equal mark MAX. MARK: 70%

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. Only scientific calculator is allowed

Section A

Q.1 (a) Discuss the difference between insulating and dielectric materials. 3mks
(b)Explain why an insulator cannot conduct electricity 2mks
(c)Would you expect the physical dimensions of a piezoelectric material to change when subjected to an electric field? Give reason for your answer. 2mks
(d)(i) Calculate the capacitance of a parallel plate capacitor having an area of 3225mm^2, a plate separation of 1 mm and a dielectric constant of 3.5 positioned between the plates. 5.5mks
(ii) Compute the electric field that must be applied for 2×10^{-8} C to be stored on each plate. 5mks

Q.2 (a) Define the following terms: (i) polarization, (ii) dielectric loss (iii) electrostriction (iv)break down voltage 4mks
(b) Explain how the charge storing capacity is increased by the insertion of a dielectric material within the plates of a capacitor. 4mks
(c)What is dielectric loss? Discuss the factors that are responsible for dielectric loss. 3mks
(d) (i) Explain with the aid of a sketch the effect of frequency on polarization 3.5mks
(ii) Calculate the electronic polarizability of argon atom given $\varepsilon_o = 1.0024$at STP and $N = 2.7\times10^{25}$atoms/m^3.3mks

Section B

Q.3 (a) What do you understand by Absolute and Relative permeability of a medium? 3.5mks
(b) The magnetic susceptibility of silicon is -0.4×10^{-5} when magnetic field intensity 5×10^{-5} A/m is applied.Calculate
(i) the flux density 3mks
(ii) magnetic moment per unit volume 4mks
(c) What is a semiconductor material and with a chat classify semiconductor materials. 7mks

Q.4(a) What is a Magnetic field. 2mks
(b) What is the difference between natural and artificial magnets.4mks 4mks
(c) Describe two properties of magnets you know?
(d) Assume that the magnitude of a magnetic field is 2.00m away from a wire is 10.0nT (nano-Tesla). What will be the electric current carried by the wire. 7.5mks

Section C

Q.5 (a) In a tabula form list the properties, response and stimulus of electronic materials. 5mks
(b) Material performance is a function of its properties. State the properties of a material that makes it suitable to be used as (i) a dielectric (ii) an insulator (iii) a conductor. 5mks
(c) A Lincoln wire 1m long and cross-sectional area of 1mm^{2}experiences voltage drop of 9V when a current of 4A passes through it. Calculate, (i) the conductivity of the wire 3.5 mks
(ii) the current density 2mks
(iii) the magnitude of the electric field across the ends of the wire. 2mks

Q.6 (a)Discuss material utilization in engineering applications 3mks
(b) Discuss the effect of temperature on the resistivity of conductors, semi-conductors and insulators 4.5mks
(b) A solid material is connected to a DC voltage source. Obtain the expression for 5mks
(i) the current density flowing through the block.
(ii) the conductivity of the material in terms of the concentration of carriers in it. 5mks

$E = \frac{Kq}{d}$

RIVERS STATE UNIVERSITY

NKPOLU, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY YEAR III

EXAMINATION QUESTION PAPER: EEE 313 ELECTRIC CIRCUIT THEORY II

2018/2019 SESSION – 1ST SEMESTER

LECTURERS: Dr. S.L. BRAIDE and Engr. P. ELECHI

INSTRUCTION: Answer any FOUR (4) Questions. At least TWO (2) questions from each section

NO. OF STUDENTS: 100

TIME ALLOWED 2 Hours

Date: 28 – 03 – 2019

Max. Mark: 80

SECTION A

Q1(a): For the circuit shown in Fig. 1, find the average power supplied by the source and the average power absorbed by the resister. [6]

(b): Determine the power generated by each source and the average power absorbed by each passive element in Fig. 2. [4]

(c): Determine the maximum power transfer for Fig. 3 [3½]

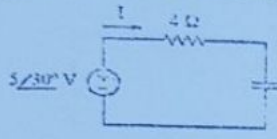


Fig. 1.

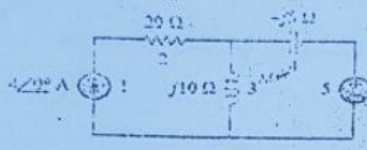


Fig. 2.

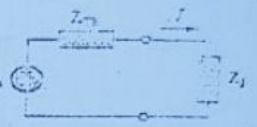


Fig. 3.

Q2(a): Determine the rms value of the current waveform in Fig. 4 if the current is passed through a 2-Ω resistor. Find the average power absorbed by the resister. [5]

(b): Determine the power factor of the circuit of Fig. 5. As seen by the source. Calculate the average power delivered by the source. [3½]

(c): The voltage across a load is $v(t) = 60\cos(\omega t - 10^{\circ})\ V$ and the current through the element in the direction of the voltage drop is $i(t) = 1.5\cos(\omega t + 50^{\circ})A$. Find (a) the complex and apparent powers, (b) the real and reactive powers, and (c) the power factor and the load impedance. [12]

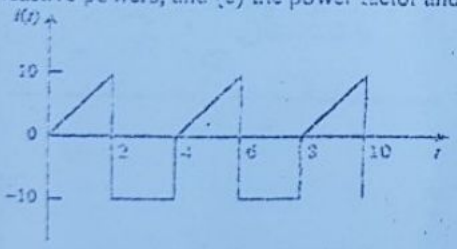


Fig. 4.

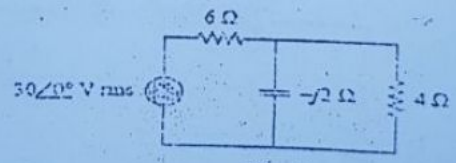


Fig. 5.

Q3(a): Calculate the line currents in the three-wire Y-Y system of Fig. 6. [5]

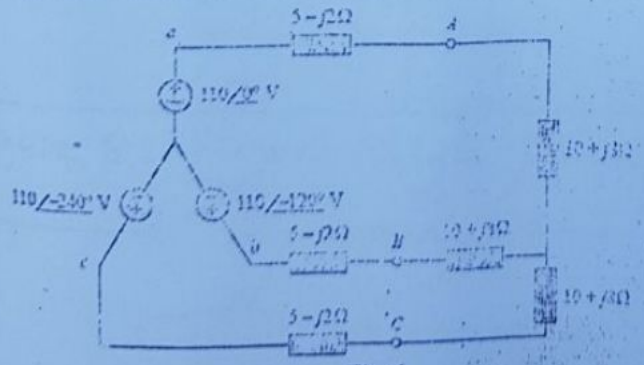


Fig. 6

(b): A balanced abc-sequence Y-connected source with $V_{an} = 100\angle 10^{\circ}$ V is connected to a delta connected balanced load $(8 + j4)\ \Omega$ per phase. Calculate the phase and line currents. [5]

(c): A balanced delta connected load having an impedance $20 - j15\ \Omega$ is connected to a delta connected, positive-sequence generator having $V_{an} = 330\angle 0^{\circ}$ V. Calculate the phase currents of the load and the line currents. [6½]

SECTION B

Q4: Consider a series RC circuit, as shown in Figure 7. The switch is closed at time $t = 0$, using differential equation technique, (i) Find the current i(t) through the circuit [10], (ii) the voltage across the resistor and capacitor. [7½]

Q5: Using state variable analysis technique in the parallel circuit of Figure 8. Develop: (a) the state variable equations [10]. (b) the state variable matrix of the state vector. [7½]

Q6: Consider the RL circuit, a time domain network as shown in Figure 9 where $R_1 = R_2 = R_3 = 1\Omega$, $L_1 = 1H$, $C = 1F$, $\ell_1 = 20V$, and $\ell_2 = 5V$, using Laplace transform, analyse and develop (a) $I_2(s)$ using determinant of matrix. [10] (b) $I_2(s)$ using determinant of matrix. [7½]

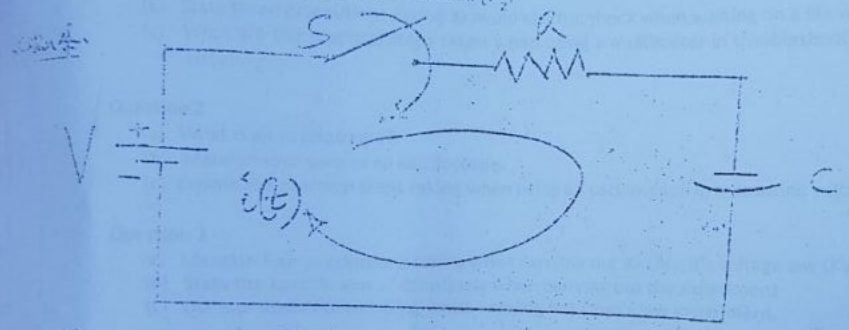


Figure 7: Series RC Circuit

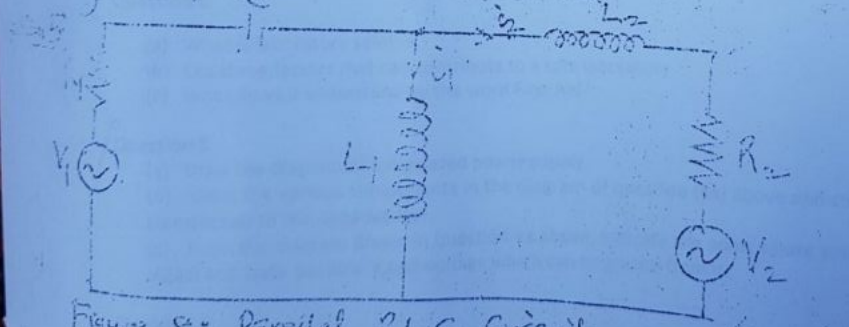
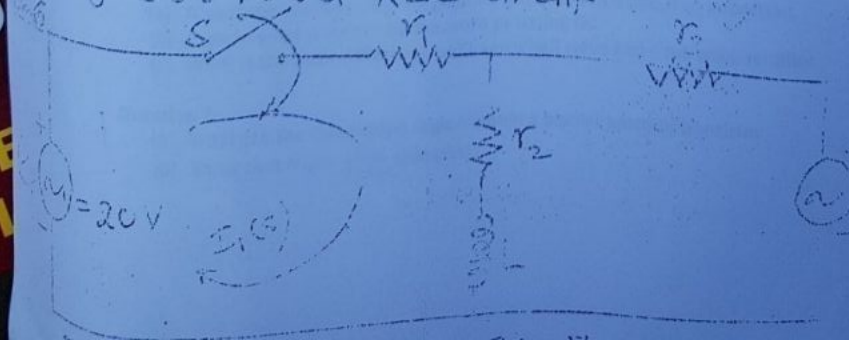


Figure 8: Parallel RLC Circuit



RIVERS STATE UNIVERSITY

NKPOLU, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of technology year III

Examination question paper: EEE303 (Circuit theory II)

2019/2020 session – 1st semester No. of Students: 200

Lecturers: Engr. Dr. S.L. Braide & Mr.obianime sylvanus Time Allowed: 2 hours

Instruction: answer any four (4) questions Date: 3-11-2020

Max. Mark: 100

Switch off all phones and keep them out of sight. Do not write anything except your matriculation number on the question paper. Only scientific calculator is allowed.

Question 1:

Consider the series- RLC circuit given in **figure 1**

Formulate:

i. Using linear differential equation (LDE) Technique, first-order differential equation (4.5marks)

ii. Using linear differential equation (LDE) Technique, second -order differential equation (4.5marks)

iii. The transient response, when the supply p.d voltage is made equal to zero (4.5marks)

iv. The characteristics equation of the network (4marks)

Question 2:

Consider a simple parallel -RC circuit given in **figure2** with input voltage V_0 the capacitor C1 is charged to the voltage

V0 and the Switch S is closed when R1 = 4mΩ, V0 = 2000v, R2 = 2mΩ, C1 = 20μF, C2 = 40μF.

Determine:

i. $\frac{di}{dt}$ (3 marks)

ii. $\frac{d^2i}{dt^2}$ (3 marks)

iii. i_2 (4 marks)

iv. Determine the characteristics roots of the equations (4marks)

v. Determine the root of the equation when it is real- root for over damped, when it is Complex- root for under damped and equal- root for critically damped (3.5marks)

Question 3 :

Consider a simple series -RLC circuit given in figure 3 with input voltage V_n

Determine:

i. Differential equations of the circuit in linear differential (LDE) (5.5marks)
ii. Determine the behavior of the circuit using Laplace transform (6 marks)
iii. Determine the voltage equation, Laplace transform and transfer function (6 marks)

Question 4:

a) Consider the parallel circuit given in **figure 4**, using state-variable analysis Technique.
Formulate:

i. The algebraic expressions of the state equations (that is the differential element of the state variable) (6 marks)

ii. The differential element of the state variables in terms of the declared state variable in matrix form. (6 marks)

iii. The voltage and current equations in terms of the physical state-variables. (5.5marks)

Question 5:

(a) Find the transfer functions of the following figure5 & 6 given in the network and Determine:

i. The transfer function: $\frac{V_o(s)}{V_t(s)}$ (4.5marks)

ii. The block representation in terms of the feedback loop (4.5marks)

iii. The algebraic expression in terms of Laplace transforms techniques. (4.5marks)

iv. State three (3) advantages and disadvantages of open-loop control system with few Examples. (4marks)

Question 6:

(i). vividly explain the meaning of attenuators in system network applications
(ii) Represent and analyze the algebraic expressions for attenuators for 'T' & (6marks)
π -section representation of transmission network in terms of characteristics impedance (z) (6marks)
(iii).Explain the following: lumped parameter, distributed parameter, continuous system,& discrete system (5.5marks)

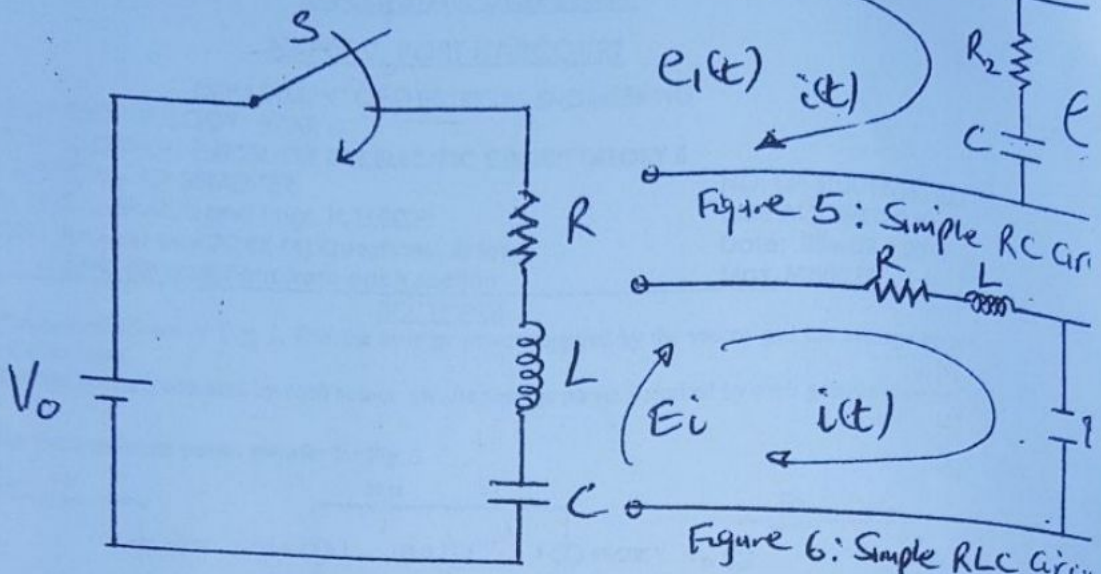


Figure 1: Simple RLC Circuit

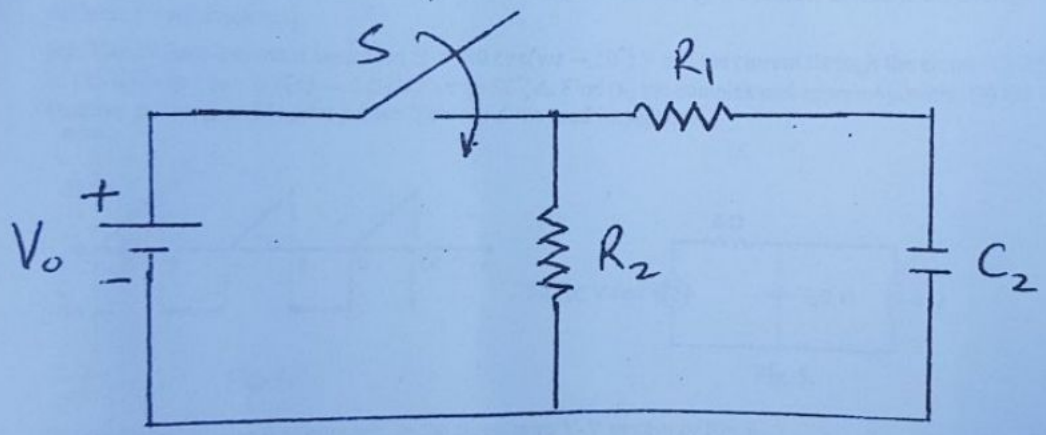


Figure 2: Simple Parallel RC Circuit.

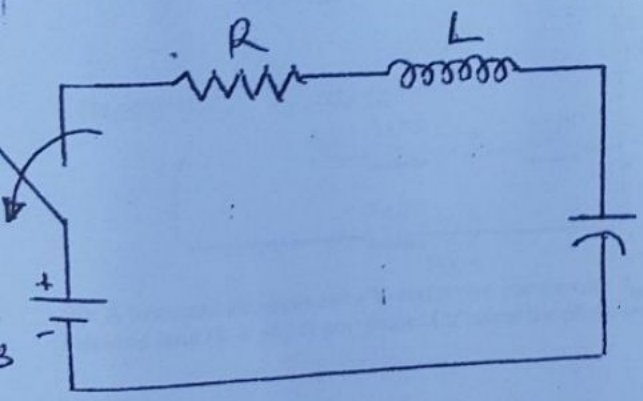


Figure 3: Simple RLC Circuit

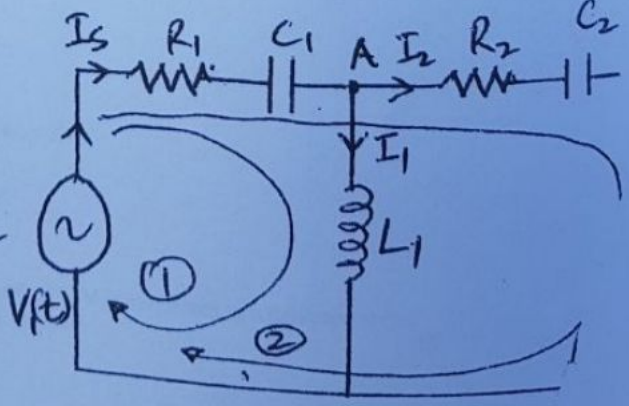


Figure 4: Simple Paralle

Figure 5: Simple RC Cir

Figure 6: Simple RLC Circu

NKPOLU, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of technology year III
Examination question paper: EEE303 (Circuit theory II)
2020/2021 session – 1st semester
Lecturers: Engr. Dr. S.I.. Braide & Mr.obianime Silvanus
Instruction: answer any four (4) questions

No. of Students: 200
Time Allowed: 2 hours
Date: 23-08-2021
Max. Mark: 100

Switch off all phones and keep them out of sight. Do not write anything except your matriculation number on the question paper. Only scientific calculator is allowed.

Question 1:

Consider the series- RLC circuit given in **figure 1**

Formulate/Determine:

i. Using linear differential equation (LDE) Technique, first-order differential equation to analyse **(5marks)**

ii. Using linear differential equation (LDE) Technique, second -order differential equation to analyse **(5marks)**

iii. The transient response, when the supply p.d voltage is made equal to zero **(5marks)**

iv The characteristics equation of the network **(5marks)**

Question 2:

Consider a simple parallel -RC circuit given in **figure2** with input voltage V_0 the capacitor C1 is charged to the voltage V_0 and the Switch S is closed when R1 = 2MΩ, V_0 = 1000V, R2 = 1MΩ, C1 = 10μF, C2 = 20μF

Determine the following expressions:

i. $\frac{di}{dt}$ **(4 marks)**

ii. $\frac{d^2i}{dt^2}$ **(4 marks)**

iii. i_2 **(4 marks)**

iv. Determine the characteristics roots of the equations **(4marks)**

v Determine the root of the equation when it is real- root for over damped, when it is Complex- root for under damped and equal- root for critically damped **(4 marks)**

Question 3 :

Consider a simple series -RLC circuit given in **figure 3** with input voltage V_B

Determine:

i. Differential equations of the circuit in terms of linear differential equation (LDE) **marks)**

ii Determine the behavior of the circuit using Laplace transform **marks)**

iii. Determine the voltage equation, Laplace transform and transfer function **marks)**

Question 4:

a) Consider the parallel circuit given in **figure 4**, using state-variable analysis Technique

Analyse and Formulate:

i. The algebraic expressions of the state equations (that is the differential element of the state variable) **marks)**

ii. The differential element of the state variables in terms of the declared state variable in matrix form. **marks)**

iii. The voltage and current equations in terms of the physical state-variables. (7 marks)

Question 5:

(a) Find the transfer functions of the following **figure 5** given in the network Determine:

i. The transfer function: $\frac{V_o(s)}{V_i(s)}$ **(6 marks)**

ii. The block representation in terms of the feedback loop **(4 marks)**

iii. The algebraic expression in terms of Laplace transforms techniques. **(4 marks)**

iv. State the importance of states variable analyses to system engineer and the major contributions by Professor Laplace in the quest for system analyses and modeling particularly to circuit & control theory **(6 marks)**

Question 6:

(i) vividly explain the meaning of attenuators in system network applications **marks)**

(ii) Represent and analyze the algebraic expressions for attenuators for 'T' section **marks)**

(iii) Represent and analyze the algebraic expressions for attenuators for π section of a transmission network in terms characteristics impedance (z)

(iv).Explain the following: lumped parameter, distributed parameter, continuous system & discrete system **(5 marks**

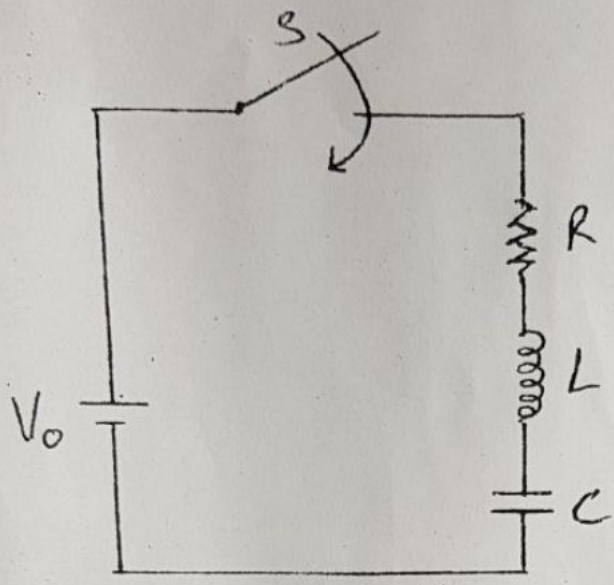


Figure 1: Simple RLC Circuit

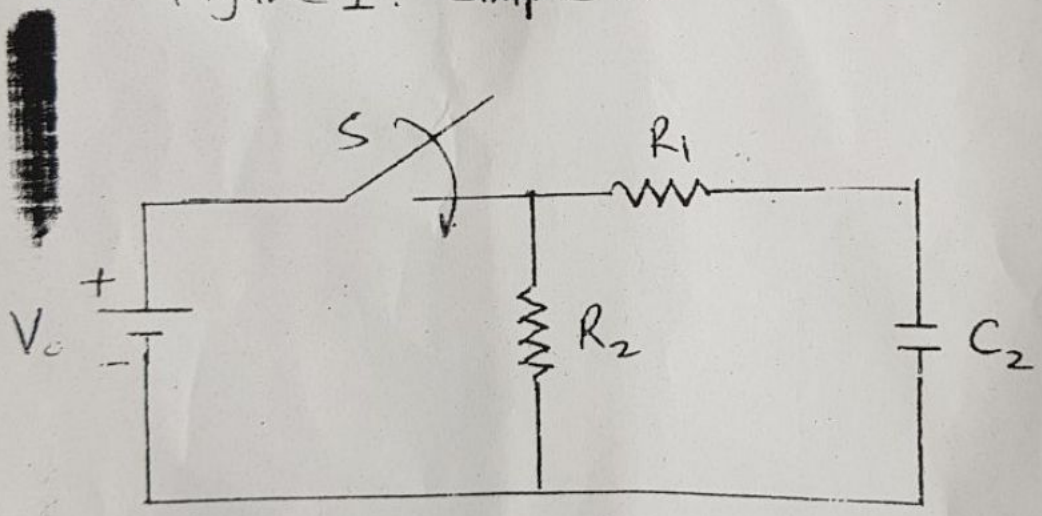


Figure 2: Simple Parallel RC Circuit

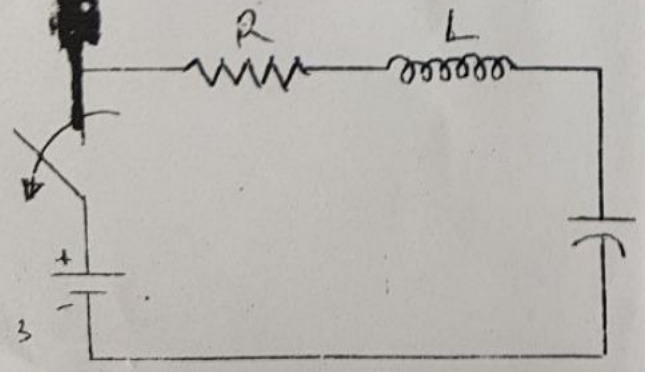


Figure 3: Simple RLC Circuit

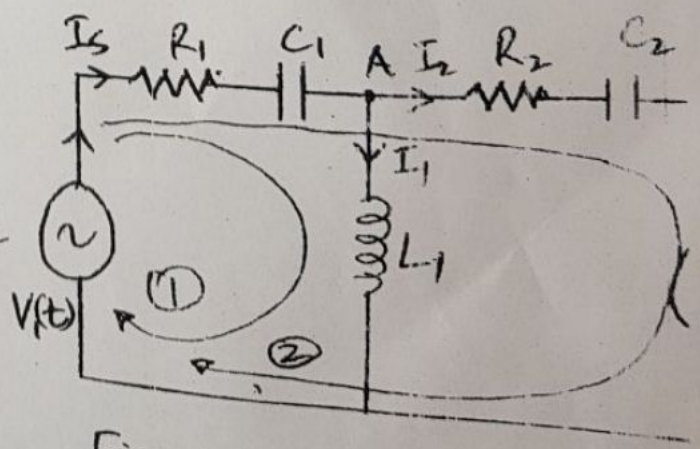


Figure 4: Simple Parallel RLC

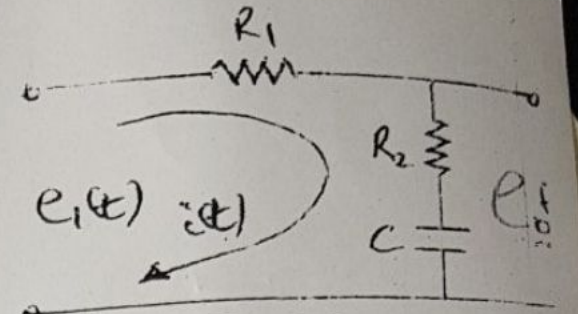


Figure 5: Simple RC Circuit

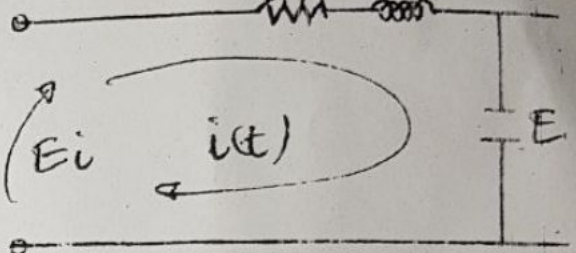


Figure 6: Simple RLC Circuit

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT
Department of Electrical Engineering
Bachelor of Technology Year 3
Examination Question Paper: EEE 302 (Electric Circuit Theory II)
2021/2022 Academic Session: 1st Semester **No of Students: 200**
Lecturer: Engr. Dr. S. L. Braide and Engr. Obianime Sylvanus **Maximum marks: 70**
Introduction: Answer any four (4) Questions.
Time Allows: $2\frac{1}{2}$ Hours **Date: 27/06/2022**

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DON NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. ONLY SCIENTIFIC CALCULATOR IS ALLOWED

QUESTION 1

Consider the given series parallel circuit of **figure 1** as shown

Determine:

(i). Current flowing in the 2 $\Omega resistor$ of the circuit, using Kirchhoff's law. **(5mark)**

(ii) Power dissipated (P), in the 3Ω resistor. **(5 mark)**

(iii). Using determinants matrix operation solve for the currents I_1, I_2 and I_3 respectively. **(7.5 mark)**

QUESTION 2

Consider the series-RLC circuit given in **figure 2**

Formulate:

i. Using linear differential equipment (LDE) Technique. (solve for voltage and current expression in the case of first-order differential equation) **(4.5 mark)**

ii. Using Linear differential equation (LDE) technique, (solve for voltage and current expression in the case of second-order differential equation) **(4.5 mark)**

iii. The transient response, when the supply p.d voltage is made equal to zero **(4.5 mark)**

iv. The characteristics equation of the network **(4 mark)**

QUESTION 3

(a). Consider the parallel circuit given in **figure 3**, using state-variable analysis technique.

Formulate:

(i) The algebraic expressions of the state equations (that is the differential element of the state variable) **(7.5 mark)**

(ii) The differential element of the state variables in terms of the declared state variable in matrix form. **(5 mark)**

(iii) The voltage and current equations in terms of the physical state-variables. **(5 mark)**

QUESTION 4

Consider a series R-L circuit as shown in **figure 4**, when the switch(s) is closed at time $t = 0$

Determine:

(i). The current i(t) in the circuit **(4.5 mark)**

(ii) Voltage across the resistor and inductor (V_R and V_L) **(4.5 mark)**

(iii) When the inductor behaves as open circuit at switching ($i(0^+) = 0$) formulate the new expression for i(t) **(4.5 marks)**

(iv) Sketch the graph of V_R versus (t) and (v) versus time (t) **(4 marks)**

QUESTION 5:

(a) Find the transfer functions of the following **figure 5** & **6** as shown in the network

Determine:

(i) The transfer Function: $\frac{V_o(s)}{V_t(s)}$ **(7.5 marks)**

(ii) The block representation in terms of the feedback loop **(5 mark)**

(iii) The algebraic expression in terms of Laplace transforms techniques. **(5 marks)**

QUESTION 6:

Consider a simple series RLC circuit given in **figure 7** with input voltage V_B

Determine:

(i). Differential equations of the circuit (LDE) **(5.5 marks)**

(ii) Determine the behavior of the circuit using Laplace transform **(6 marks)**

(iii) Determine the voltage equation, Laplace transform **(6 marks)**

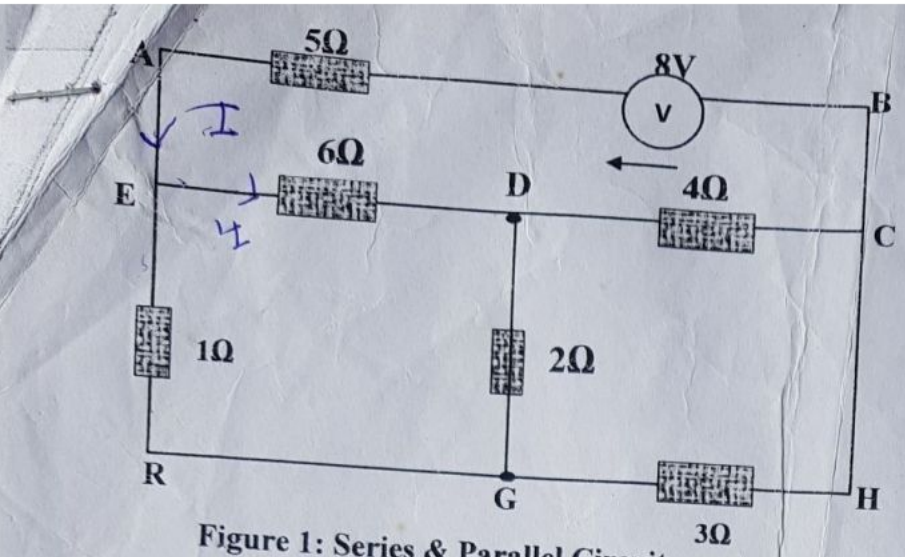


Figure 1: Series & Parallel Circuit

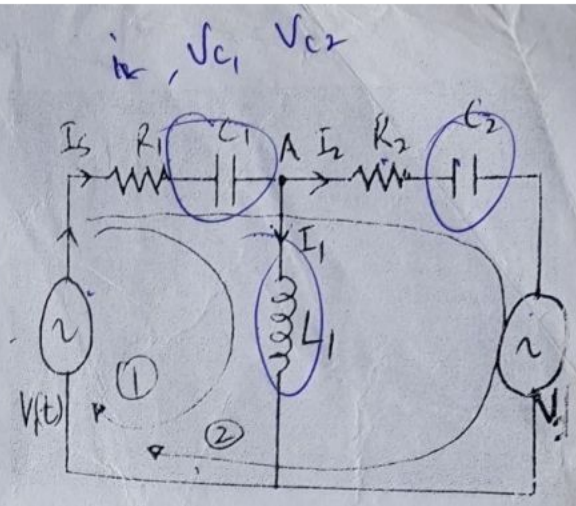


Figure 3: Simple Parallel RLC

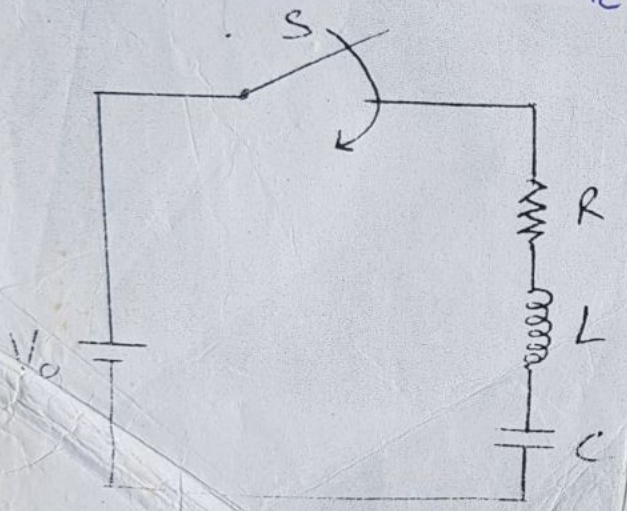


Figure 2: Simple RLC Circuit

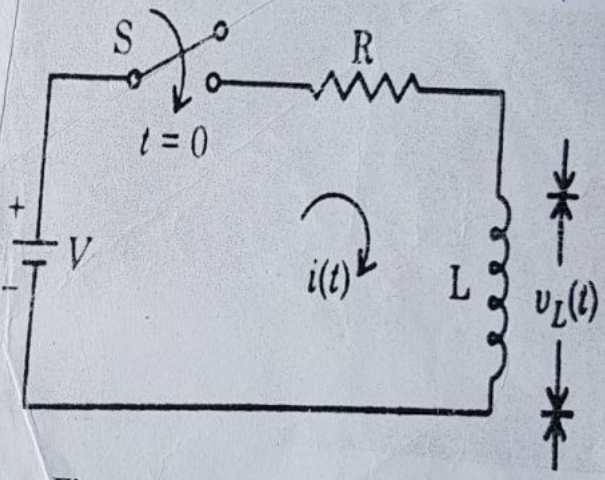


Figure 4: Series R-L Circuit

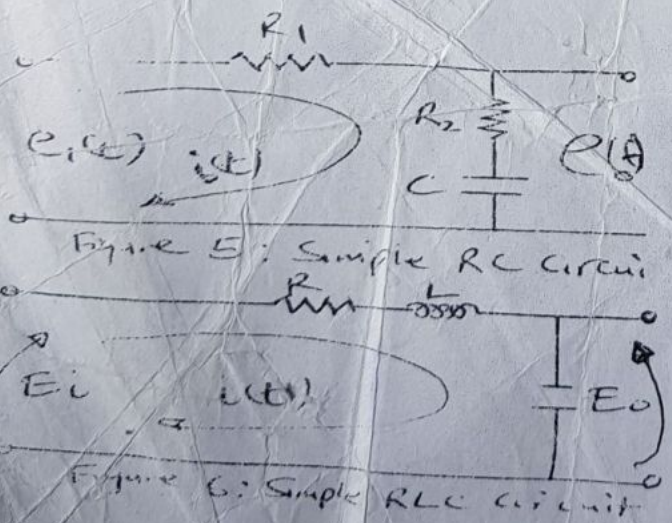


Figure 5&6: Simple RC Circuit and Simple RLC Circuit

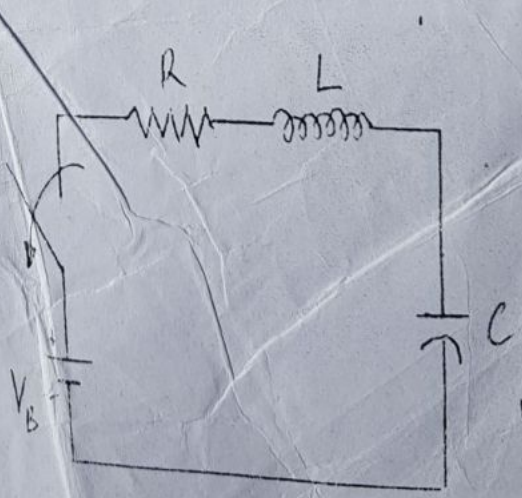


Figure 7: Simple Series RLC Circuit

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B. TECH): **YEAR III [Elect Engrg & Voc. & Tech Edu.]** DATE: 05/11/2
EXAMINATION PAPER: **EEE 321/311. (ELECT MEASUREMENT I)** NO. OF STUDENTS:
2019/2020 SESSION – **1ST SEMESTER** TIME ALLOWED: 3
LECTURERS: **Engr. T. K. BALA & Engr. E.I. WODI** MAX. MARK
INSTRUCTION: **Answer two (2) questions in each section. Answer a total of four (4) questions in al**
All questions carry equal marks

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANY ING EXCEPT YOUR MATRICULATION NUMBER ON QUESTION PAPER. *Only scientific calculator is allowed*

Section A (2 Questions only)

Question 1:

a) *Derive the dimensional equations in SQUARE BRACKETS for the following derived units:*
i) Resistance, R. *ii) Apparent power, VA.* (4

b) *The five (5) resistors had the following ratings.*
$R_1 = 10\Omega \pm 2.5\%$, $R_2 = 5\Omega \pm 6\%$, $R_3 = 15\Omega \pm 1.33\%$, $R_4 = 8\Omega \pm 1.25\%$, $R_5 = 20\Omega \pm 1.25\%$

i) *Determine the magnitude, and the maximum possible limiting error in ohm and in percent of the r connected in series.* (3.5

ii) *Determine the magnitude and the limiting error in volts and in percent of the voltage drop across each res an applied voltage of 120V ± 5% is connected across the series resistors.* (10

(17.5

Question 2:

a) *In a spring-controlled indicating instrument, the maximum allowable stress on the spring is* 6.89×10^3 *kg/ Young's Modulus of the spring material is* 10×10^{-2} *kg/m². The control is exerted through two spiral spr the width of the springs strip is equal to 1mm. Determine a suitable spring dimensions if the deflectin corresponding to a full-scale deflection of 60° is* 1.65×10^{-4}*Nm. (Take* $g = 10\,m/s^2$*).* (5

b) *The deflecting torque of a moving-iron, attraction-type ammeter instrument varies directly as the square of the and the product of the* $\sin 2(\theta + \alpha)$*. The initial angle mode by the axis of the soft iron disc with direction magnetic field produced by the coil when no current flow through it is 0.0873 radian. When a current of 0.3 through the coil, the deflection is 0.5436radian. What current would produce a deflection of* $\frac{\pi}{3}$ *radian w instrument uses:*

i. *Spring Control System.*
ii. *Gravity Control System* (6
(6
(17.5n

Question 3:

a) *Define: (i) Deflecting torque, (ii) Controlling torque, (iii) Damping torque* (3

b) *In a gravity-controlled system, the controlling weight, w is 560g and acts at a distance of 40cm from th of the moving system. Determine the deflection of the pointer in radian corresponding to a deflecting of* 120×10^{-3} *kgm. Also if the deflection is* $\frac{\pi}{3}$ *radian, determine the controlling torque required.* (3.5n

c) *Evaluate the deflection of the pointer for a current of 1.5A, if the inductance of a moving-iron ammete a full-scale deflection of 90° at 5A is given by* $L = (30\theta + 32\theta - 3\theta^2 - \theta^3)\mu H$ *where* θ *is the deflection in r from the zero position.* (11.5n

$$R = \frac{V}{I} = \frac{W/q}{I} = \frac{F \times d}{T} = \frac{M \times LT^{-2} \times L}{T}$$

$$\frac{M \times L^2 T^{-2}}{TI^{-1}}$$

(17.5

$$M \times L^2 T^{-3} I$$

Section B

Question 4:

a) Draw a simplified arrangement of a magnetic tape recorder and briefly describe it's operation (11.5 marks

b) List six (6) recording instruments (6 marks

(17.5 marks

Question 5:

The power input to a 200v 50 HZ, 3-phase motor running on full-load at an efficiency of 90% is measured b two wattmeters which indicate 300 kw and 100 kw respectively. Find the load current and the output pow er

(17.5 marks

Question 6:

a) Draw and label the main components of the Cathode Ray Tube. (8.5 mark

b) Briefly discuss: (i) the deflecting plates (3 mark

(ii) Electron gun assembly (3 mark

(iii) Glass envelope (3 marks

41.5

(17.5 mark

Vertical Amplif Relay

Electron Gun Horizon Amp

Vertical deplet plate

Horizontal deplet plate

Screen

GOOD LUCK!

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY(B. TECH):**YEAR III [Elect Engrg & Voc. & Tech Edu.]**DATE: **09/09/2021**
EXAMINATION PAPER: **EEE 321/311. (ELECTRICAL MEASUREMENT I)** NO. OF STUDENTS: **250**
2020/2021 SESSION – **1ST SEMESTER** TIME ALLOWED: **3HRS**
LECTURERS: **Engr. TK. BALA & Engr WONODI IKONWA** MAX. MARK: **70%**
INSTRUCTION: **Answer four (4) questions. Two questions in each section.**
All questions carry equal marks

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

Section A- (Engr. T.K. Bala)

Question 1:

a) Derive the dimensional equations in SQUARE BRACKETS for the following derived units:
(i) Power, P. (ii) Magnetic flux, Ø. (iii) Resistance, R. **(6 marks)**

b) The following measurements were conducted during a laboratory experiment on resistors and tabulated below.

S/No	Actual Value (Ω)	Measured Value (Ω)	Absolute Error (Ω)	Relative Error (%)
1.	10.00	10.15		
2.	15.00	16.50		
3.	20.00	21.25		
4.	25.00	26.05		
5.	30.00	30.75		

i) Complete the table by computing the absolute and relative errors as stated in the table above. **(5marks)**

ii) If the five resistors of the actual measurements are connected in series, determine the maximum possible limiting error in watts and percent of the circuit's active power if a current of $1.50A \pm 0.1\%$ *flows in the circuit.* **(6.5marks)**

(17.5marks)

Question 2:

a) If each plate of a capacitor is circular having a diameter of $200\text{cm} \pm 1\%$*, and each has a total static charge of* $(0.5 \pm 0.1)C$*, determine:*

(i) The magnitude of the electric field strength E between the plates in N/C if the dielectric is air. **(3marks)**
(ii) The magnitude of the potential difference V, if the distance d between the plates is $580\text{cm} \pm 2.5\%$. **(2marks)**
(iii) The limiting error in the electric field quantity expressed in percent and N/C. **(4.5marks)**
(iv) The limiting error in the potential difference expressed in percent and volts. **(3marks)**

[Hint: $E = {}^{Q}/_{A\varepsilon}$, $V = Ed$, $\varepsilon_0 = 8.854 \times 10^{-12}\ F/m \pm 10\%$, $A = area$*]*

b) In a gravity-controlled instrument, the controlling weight, W is $850g$ *and acts at a distance of* 50cm *from the axis of the moving system. Determine the deflection of the pointer in radians corresponding to a deflecting torque of* $139.25 \times 10^{-3} kgm$*.* **(5marks)**

(17.5marks)

Question 3:

(a) The torque of an ammeter varies directly as the cube root of the current through it. If a current of 729 A Produces a deflection of 0.5236 radians, what current would produce a deflection of 0.7854 radian when the instrument is:

i. Spring Controlled. **(5marks)**

ii. Gravity Controlled. **(6marks)**

(b) In a spring-controlled indicating instrument, the control is achieved by a phosphor-bronze spring. The maximum allowable stress is $24.85 \times 10^{-1}\ kg/m^2$ and Young's Modulus of the spring material is $1.18 \times 10^{-2}\ kg/m^2$ for a spring strip width of 0.88mm. Determine a suitable spring dimensions if the deflecting torque corresponding to a full-scale deflection of 60° is $18.5 \times 10^{-2} Nm$ $(Take\ g = 10\,m/s^2)$. **(6.5 marks)**

(17.5marks)

Section B - (Engr. W. Ikonwa)

Question 4:

(a) Explain briefly, the difference between a recording instrument and an indicating instrument **(2.5 marks)**

(b) Explain with relevant diagrams the following:

i) Strip-chart recorder **(5marks)**

ii) X-Y recorder **(5marks)**

iii) Magnetic tape recorder **(5marks)**

(17.5 marks)

Question 5:

(a) A 3 phase, 500V motor has a power factor of 0.4. Two wattmeterswere connected to measurethe power if the input be 30kW. Find the reading on each wattmeter. **(8.5 marks)**

b) A moving coil instrument has 150 turns of wire with a resistance of 15Ω, an active length in the airgap of 8m and width 5m. A potential difference of 65mV, produces full scale deflection. The controlling spring exerts a torque of $485.5 \times 10^{-7} Nm$ at full-scale deflection. Calculate the flux density. **(9marks)**

Question 6:

A moving coil instrument has a resistance of 2Ω and gives full scale deflection when a voltage of 100mV is applied across it. Calculate:

a) The value of shunt to make the meter to read up to 100A **(6marks)**

b) The series resistance (multiplier) for full scale reading with 600V. **(6marks)**

c) Find the power consumption in questions 6a & 6b above **(5.5 marks)**

(17.5 marks)

Good luck

RIVERS STATE UNIVERSITY

NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL, COMPUTER ENGRG AND VOCATIONAL TECHNOLOGY EDUCATION

BACHELOR OF TECH., **YEAR III & IV**
SESSION: **2021/2022**
DATE: **10TH MAY, 2022.**
NO. OF STUDENTS:

COURSE TITLE: **EEE 311/321**
FIRST SEMESTER
TIME ALLOWED: **40min**
MAX. MARK: **10%**

CONTINUOUS ASSESSMENT TEST FOR SECTION A

INSTRUCTION: **Answer all Questions**

Question 1: Three resistors had the following ratings **R1=10 ± 5%**, **R2= 20± 5%** and **R3 = 15 ± 5%.** Determine the magnitude, and the limiting error in ohm and in percent of the resistance of these resistors connected in **parallel.** Draw the parallel connection of these resistors respectively. Determine the maximum possible limiting error in watts and percent of the circuit's active power if a source voltage of 6V ± 0.5% across the circuit when connected in **parallel**.

[8]

Question 2: Derive the dimensional equations in SQUARE BRACKETS for the following derived units: (i) Resistance, **R**. (ii) Capacitance, **C**.

[2]

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B. TECH): **YEAR III [Elect, Comp Engrg & VT Edu.]** DATE: **14/07/2022**
EXAMINATION PAPER: **EEE 321/311. (ELECTRICAL MEASUREMENT I)** NO. OF STUDENTS: **300**
2021/2022 SESSION – **1ST SEMESTER** TIME ALLOWED: **3 HRS**
LECTURERS: **Engr. TK BALA & Engr. WONODI IKONWA** MAX. MARK: **70%**
INSTRUCTION: **Answer four (4) questions in all. Two questions in each section. All questions carry equal marks**

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

Section A (2 Questions only) – Engr. T.K. Bala

Question 1:

a) *Derive the dimensional equations in SQUARE BRACKETS for the following derived units: (i) Power, P. (ii) Voltage, V. (iii) Capacitance, C.* ***(6 marks)***

b) *The following measurements were conducted during a laboratory experiment on capacitors and tabulated below.*

S/No	Actual Value (μF)	Measured Value (μF)	Absolute Error (μF)	Relative Error (%)
C1.	0.4	0.401		
C2.	0.8	0.802		
C3.	0.6	0.615		

i) *Complete the table by computing the absolute and relative errors as stated in the table above.* ***(3marks)***

ii) *Determine the magnitude, and the maximum possible limiting error in μF and in percent of the capacitance of these capacitors connected in series.* ***(7marks)***

iii) *If applied voltage of 12V ± 0.2% is across the circuit in series error, determine the magnitude and the limiting error in micro-coulomb and in percent of the charges through the capacitors.* ***(1.5marks)***

Question 2:

a) *Distinguish between absolute instrument and secondary instrument* ***(3marks)***

b) *The torque of an ammeter varies directly as the 5th root of the current through it. If a current of 32A produces a deflection of 0.4363 radians, what would be the deflection if a current of 15A is to be measure by the instrument using:*

i. *Spring Control.*
ii. *Gravity Control* ***(4marks)***

(4marks)

c) *In a spring-controlled indicating instrument, the maximum allowable stress on the spring is* $5.56 \times 10^3\ kg/m^2$ *and Young's Modulus of the spring material is* $10 \times 10^{-2}\ kg/m^2$. *The control is exerted through two spiral springs and the width of the springs strip is equal to 1mm. Determine a suitable spring dimensions if the deflecting torque corresponding to a full-scale deflection of* 90° *is* $18.5 \times 10^{-2} Nm$ *(Take* $g = 9.81\ m/s^2$*).* ***(6.5marks)***

Question 3:

a) *Neatly draw, label and discuss the two methods of damping by air friction.* ***(5marks)***

b) *Evaluate the deflection of the pointer for a current of 1.5A, if the inductance of a moving-iron ammeter with a full-scale deflection of 90° at 5A is given by* $L = (250 + 620\theta - 60\theta^2 - \theta^3)\mu H$ *where* θ *is the deflection in radian from the zero position.* ***(10.5marks)***

c) *Draw and label the response of the dynamic system for deflection,* θ *versus time, t* ***(2marks)***

Section B (2 Questions only) - Engr. W. Ikonwa

Question 4:

(a) Three impedances each having a resistance of 15Ω and inductive reactance of 10Ω are connected in
(i) Star (4marks)
(ii) Delta, across a 415V, 3 phase supply. (4.5marks)
For each case, find the reading of the two wattmeters connected to measure the power.

(b) Define the following:
(i) Phase difference of a sine wave (1mark)
(ii) Leading phase (1mark)
(iii) Lagging phase (1mark)

(c) A cathode ray tube has an accelerating voltage of 3kV and parallel deflecting plates 2.5cm long and 5mm apart and the distance of the screen from the centre of the plates is 60cm.
Find the:
(i) Velocity of the beam (3marks)
(ii) Deflection sensitivity of the tube (3marks)
[Take the Charge on electron is $1.6\times 10^{-19}C$ and the mass of electron is $9.1 \times 10^{-31} kg$]

Question 5:

(a) Briefly explain the following: 30
(i) Cathode Ray Oscilloscope (1.5marks)
(ii) Sweep generator (1mark)
(iii) Horizontal amplifier (1mark)
(iv) Persistence (1mark)

(bi) List and explain the four components of the cathode ray tube (4marks)
(bii) Draw and label the diagram of a cathode ray tube (6marks)

(c) List 3 fluorescent materials used in coating the phosphor screen and the type of colour it gives when beam of electrons strike on it (3marks)

Question 6:

(a) Draw and label the block diagram of a cathode ray oscilloscope (7.5marks)

(b) The horizontal and vertical plates of a cathode ray tube have their lengths of 3.5cm and the distance between the two pairs of plates is 5.5cm. Both pairs of plates are at the same potential difference of 120V (rms). Find the length of line produced on the screen at a distance of 45cm from the centre of the near plates. Let anode voltage be 1200V. The distance between the two plates forming a pair is 2.2cm. (10marks)

Good luck!

RIVERS STATE UNIVERSITY NKPOLU, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY YEAR III ELECTRICAL

EXAMINATION QUESTION PAPER: **EEE 331 Electronic Devices**

2019//2020 SESSION – 1ST SEMESTER

NO. OF STUDENTS 250

*LECTURERS: Engr's R.C. OTI & V. Q. **WILLIAMS.***

TIME ALLOWED 2 ½ Hrs

INSTRUCTION: Answer FIVE (5) Questions

Date: 02 – 11 – 2020

---

1. Write down the following equations associated with Borhs atomic model

i) Velocity of a revolving electron

ii) Orbital rotational frequency* of an electron

iii) Kinetic energy due to the motion of the electron

iv) The potential at a point distant r from the nucleus of an atom.

4marks

b.) Graphically show how a Semiconductor can be classified.

3marks

c) The two most common classifications of transistors are, list them.

2marks

d.) Bipolar junction transistors (**BJT**) are so-called because current flow is due to, and list the types

2marks

e.) Show that"common-base current gain", α is given by; $\alpha = \frac{I_C}{I_E} = \frac{\beta}{\beta+1}$.

3marks

2 a. Calculate the value of the kinetic, potential and total energy of an electron revolving in Bohr's first orbit in a hydrogen atom. Given that K.E. = $\frac{me^4}{8\epsilon_0^2 n^2 h^2}$ P.E. = $\frac{me^4}{4\epsilon_0^2 n^2 h^2}$

Total energy = K.E. + P.E. 7marks

b. Calculate the donor concentration in N-type germanium having resistiivity of ρ_n = 50Ω-m. Derive the formula you use. Take e=1.6 x 10^{-19}C, $\mu_e = 0.36 m^2 V^{-1} s^{-1}$ 7marks

3 a. Mobilities of electrons and holes in a sample of intrinsic germanium at room temperature are 0.26m^2/volt-second and 0.11 m^2/volt-second respectively. If the electron and hole densities are each equal to 2.5 x 10^{-12} per m^3, calculate the conductivity σ_i in S/m.

7marks

b. A germanium diode draws 60mA with a forward bias of 0.30V. The junction is at room temperature of 293°K. Calculate the reverse saturation current of the diode $I = I_0 (e^{40V} - 1)$.

7marks

4 a. Calculate the barrier potential for Si junction V_B at (i) 100°C and (ii) 0°C if its value at 25°C is 0.7V.Given that $\Delta t = (t_2 - t_1)$ and $\Delta V = -0.002 (t_2 - t_1)$ the barrier potential for Si junction V_B at any temperature in °C is $V_B = t_1 + \Delta V$. 7marks

(b List the uses of p-n junction diode. Using I-V characteristics of the Zener diode explain the region of operation and nature of connection.

7marks

5 a) A specimen of pure germanium at 300^0K has a density of charge carriers of $2.5 \times 10^{19}/m^2$. It is doped with donor impurity atoms at the rate of one impurity atom for every 10^6 atoms of germanium. All impurity atoms may be supposed to be ionized. The density of germanium atom is 4.2×10^{28} atom/m^3.

7marks

b) A germanium diode draws 40mA with a forward bias of 0.25V. The junction is at room temperature of 293°K. Calculate the reverse saturation current of the diode. $I = I_o (e^{40V} - 1) = I_S$

7marks

6 Determine and plot the Q-point of the transistor shown figQ6 and find the maximum peak value of the base current for linear operation. Assume $\beta_{DC} = 200$.

20marks

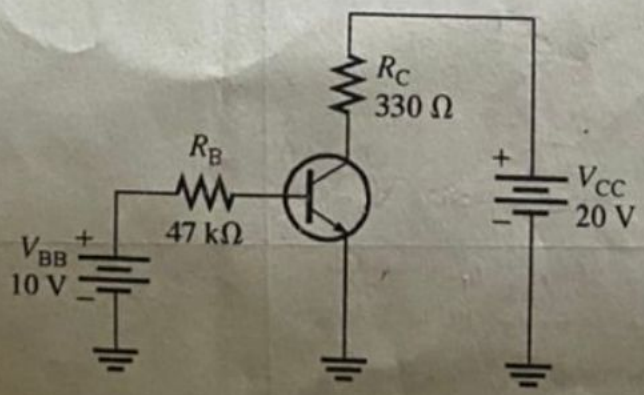


Fig.Q6 Circuit Diagram

7 a) List and dicuss briefly with suitable diagrams the different types of field effect transistors.

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B. TECH): YEAR III
EXAMINATION PAPER: EEE 331 (ELECTRONIC DEVICES)
2020/2021 SESSION – 1ST SEMESTER
LECTURERS: ENGR. R.C. OTI, ENGR. K.E. ORIE & ENGR. DR. S.A. BRUCE-ALLISON
DATE:06 /09/2021
NO. OF STUDENTS: 200
TIME ALLOWED: 2HRS
MAX. MARK: 70%
INSTRUCTION: ANSWER MINIMUM OF ONE (1) QUESTION FROM EACH SECTION AND ANY OTHER ONE OF YOUR CHOICE FROM ANY OF THE THREE SECTION, TOTALING FOUR (4) IN ALL.

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

SECTION A

QUESTION 1A)

Differentiate between the types of mode of a Depletion – type MOSFET, hence do a free hand sketch of both an E and D MOSFET. (5mks)

1B) Compare between field effect transistors (FET) and bipolar junction transistor (BJT) (5mks)

1C) A germanium transistor used in a complementary symmetry amplifier has a collector cut-off current Icbo = 10mA at a temperature of 27°C and hFE = 50

i) What is the collector current, when the base current is 0.25mA (3.5mks)
ii) Assuming hFE does not increase with temperature, what would be the value of new collector current, if the transistor current rises to 50°C (4mks)

QUESTION 2A)

State three (3) applications of a transistor (2.5mks)

2B) With the aid of a well labelled diagram, explain the configurations of a bipolar junction transistor (6mks)

2C) Fig.(2i,2ii &2iii) shows the open circuit failures in a transistor. What will be the circuit behaviour in each case? (9mks)

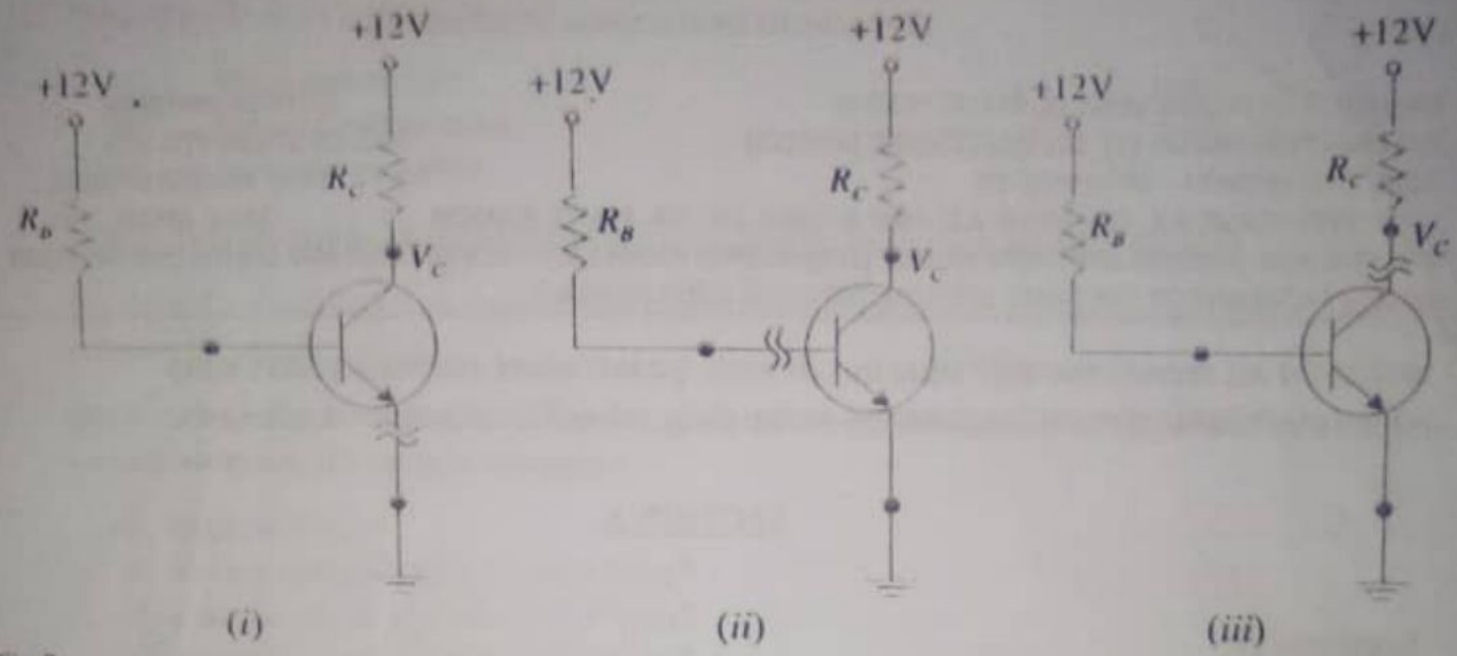


Fig.2.

SECTION B

QUESTION 3A)

Write briefly on the important characteristics of a rectifier circuit, hence state all mathematical formula where necessary. (6mks)

3B) Briefly explain with the aid of diagram, the operation of a bridge rectifier, hence draw the input and output waveform of bridge rectifier. (4mks)

3C) Fig. (3i and 3ii) shows the Centre – tap and bridge type circuits having the same load resistance and transformer turns ratio. The primary of each is connected to 230V, 50HZ supply, find

i) The dc voltage in each case (4mks)

ii) The PIV for each case for the same dc output, assume the diode to be ideal. (3.5mks)

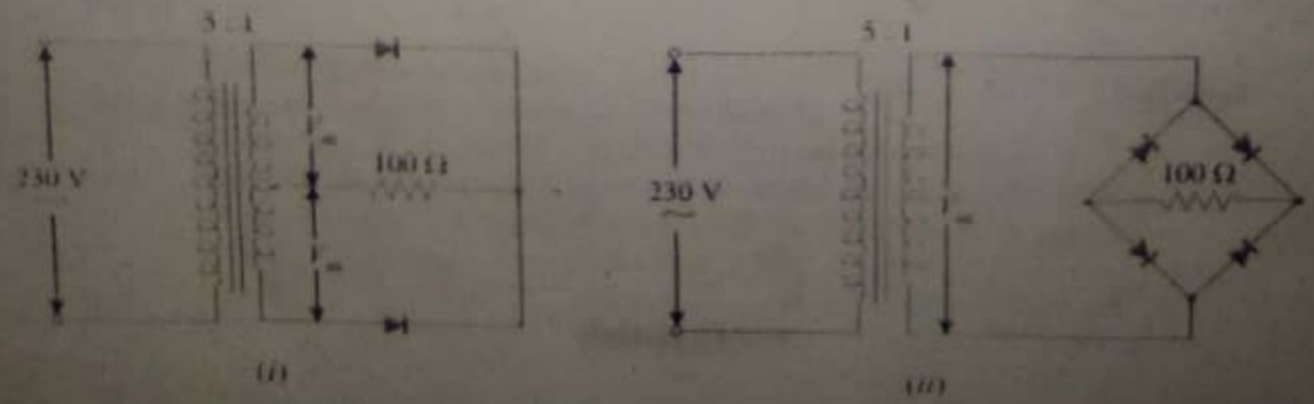


Fig. 3.

QUESTION 4A)

State the effects of temperature on:

i) Diode parameters (1mk)
ii) Forward voltage drop (1mk)
iii) Dynamic resistance

4B) List ten (10) special diode available and state two (2) application for each. (5mks)

4C) With the aid of diagrams, write briefly on the process involved in the connection of p-n junction to an external DC voltage source (4.5mks)

4D) A young designer aiming to develop intuition concerning bar 10μm long, 3μm wide, 1μm thick, made of various materials, the designer considers

i) Intrinsic silicon
ii) n-doped silicon with ND = $1x10^{10}/cm^3$
iii) n-doped silicon with ND = $1x10^{10}/cm^3$
iv) p-doped silicon with ND = $1x10^{10}/cm^3$
v) Aluminum with resistivity of 2. 8μΩ.cm, find the resistivity in each case, for intrinsic silicon use μn = $1350cm^2$/V.S, μp = $480cm^2$/V.S and ni = $1.5x10^{10}/cm^3$, for doped silicon assume μn =2.5 μp = $1200cm^2$/V.S, (Hint: R = ρl/A) (10mks)

SECTION C

QUESTION 5

i) What is an Integrated Circuit (IC)? (3mks)
ii) List five (5) IC families you have studied. (2.5mks)
iii) What are the limitations of ICs (2mks)
iv) Explain five (5) steps used in the fabrication of ICs (10mks)

QUESTION 6

i) list five (5) commonly used ICs (2.5mks)
ii) Draw and explain the pin diagram of 555 timer IC (6mks)
iii) Explain the following terms as applied in IC (i) fan-in (ii) fan-out (2mks)
iv) State the formulae used in determining fan-in and fan-out of an IC. Hence or otherwise determine the fan-in and fan-out for a gate in the family that has the following parameters: IOH = 400μA, IOL = 10mA, IIH = 150μA, IIL = 4mA. (7mks)

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B. TECH): **YEAR III**
EXAMINATION PAPER: **EEE 361. [INTRO. TO RENEWABLE ENERGY]** DATE: **06/11/2020**
2019/2020 SESSION: **1ST SEMESTER** NO. OF STUDENTS: **150**
LECTURERS: ***Engr. L. DUMKHANA, *Engr E.K ORIE & *Engr. T. K. BALA,** TIME ALLOWED: **2½HRS**
INSTRUCTION: **Answer a total of four questions. At least one question in each section and the remaining one question from any of the sections' unanswered questions. All questions carry equal marks** MAX. MARK: **70%**

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

Section A

Question 1

(a)(i) What do you understand by solar power devices? *(2marks)*

(ii) What do you understand by photovoltaic cell and why do we need solar energy? *(4marks)*

(b)(i) With the aid of a diagram describe the rules for solar positioning? *(3.5marks)*

(ii) What does it take to solar power any facility *(4marks)*

(c)What do you understand by conventional and non- conventional source of energy? *(4marks)*

Question 2: *(17.5marks)*

(a) (i) *Determine the full and the essential load audit of a facility that contains this component computer (1000W), Air-conditioner (1.5hp), photocopier (250W), TV Set (100W) fan (75W) lighting bulb (16 numbers@ 11W each), refrigerator(400W), laptop (300W), projector(100W) and printer (30W).* *(5marks)*

(ii) *Using the result gotten from the essential load in question 2a(i). Determine the total power needed for the facility for the period of eight (8) hours per day with three (3) days of autonomy* *(6marks)*

(b) *Calculate the safe energy storage in question 2a(ii) and the total number of batteries needed in parallel and series connection.* *(6.5marks)*

Section B

Question 3: *(17.5 marks)*

Table 3.1 Monthly Discharges

Month	m^3/s	Month	m^3/s
January	200	July	1600
February	400	August	1200
March	600	September	2000
April	2400	October	1200
May	1200	November	800
June	1800	December	400

(a) *The mean monthly discharge at a particular site is given in table 3.1above. From the table above, draw the hydrograph and flow duration curve using free hand sketch* *(4marks)*

ii) Determine the average inflow (2marks)
iii) Determine the power that can be developed at an effective head of 90m (2marks)

1(b)
i) List five (5) factors to be considered in selecting a site for hydroelectric power plant (2.5marks)
ii) List four (4) merits hydro energy has over other types of renewable energies. (2marks)
iii) List any five (5) elements of hydroelectric power plant and state its function (5marks)

(17.5 marks)

Question 4:

a) State the mathematical formula for calculating the specific speed of a turbine and hence calculate the specific speed of a turbine assuming numerical values for each parameter. (4marks)
b) Discuss four (4) Advantages and limitations each of tidal energy (power) (4marks)

c) List and explain the methods of tidal power generation and hence state the formula to calculate the power generated in watts (9.5marks)

(17.5 marks)

Section C

Question 5:

(a) Neatly draw and label a wind turbine power generating system (7 marks)
(b) Discuss the operational principles of a wind turbine power generating system (4.5 marks)
(c) Enumerate and discuss two (2) advantages and disadvantages of wind energy system (6 marks)

(17.5marks)

Question 6:

(a) Is biomass termed as renewable energy sources? Yes/No, explain in brief. (2.5 marks)
(b) Discuss the working principles of the utilization of biomass energy system. (9 marks)
(c) State three (3) advantages and disadvantages of the utilization of biomass energy sources (6 marks)

(17.5 marks)

GOOD LUCK

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B. TECH): **YEAR III** DATE: **25/08/2021**
EXAMINATION PAPER: **EEE 361. (INTRO. TO RENEWABLE ENERGY)** NO. OF STUDENTS: **196**
2019/2020 SESSION – **1ST SEMESTER** TIME ALLOWED: **2 HRS**
LECTURERS: **[A]Engr. Dr. H.N. AMADI, [B]Engr. E.K ORIE & [C]Engr. T. K. BALA** MAX. MARK: **70%**
INSTRUCTION: **Answer a total of four questions. At least one question in each section and the remaining one question from any of the sections' unanswered questions. All questions carry equal marks**

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

Section A

Question 1:

(a) Mention and discuss briefly 5 parameters of a solar panel that are required for solar system calculation/design purposes. ***(7 Marks)***

(b) Consider a solar cell which parameters are $J_{sc} = 350A/m^2$, $V_{oc} = 0.6V$, $FF = 0.8$ and Irradiance for $P_{in} = 1000\ W/m^2$. Calculate the efficiency of the solar cell. ***(10.5 Marks)***

Question 2:

(a) Explain the following terms as applied in Renewable Energy Systems:
(i) PV Modules ***(2 Marks)***
(ii) PV Array ***(2 Marks)***
(iii) Battery Bank ***(2 Marks)***
(iv) Inverters ***(2 Marks)***
(v) Irradiance ***(2 Marks)***

(b) Explain in details and with the aid of appropriate diagrams two (2) ways in which electricity can be generated from sunlight. ***(7.5 Marks)***

Section B

Question 3:

(a) List and explain the functions of the principal elements of the governor in a water turbine. ***(4 Marks)***

(b) Use a free hand sketch, draw the efficiency curves of reaction and impulse turbine ***(3 Marks)***

(c.) A Hydroelectric Station has a mean head of 30m and receives inflow from a catchment area of 300Km^2 having an average rainfall of 200cm per annum. The rainfall occurs during the monsoon period of 90 days in a year. The storage capacity of the station is limited to half the total inflows. if 70 percent of the rainfall reaches the reservoir, determine the minimum capacity of the station. assume that no head is lost in pipes etc. and the efficiencies of turbine and generator are 85% and 95% respectively. Determine also the total energy produced and the plant use factor. ***(10.5 Marks)***

Question 4:

(a) Write briefly on Tidal energy, hence list the three (3) methods of tidal power generation **(5.5 Marks)**

(b) State the advantages of hydroelectric energy over the other sources of renewable energies. **(2 Marks)**

(c) A hydroelectric station is to be designed to operate at a mean head of 205m and supplied from a reservoir having a catchment area of 1000Km^2 with average annual rainfall of 125cm of which 80% is available for power generation. The expected load factor at the plant is 75%. Allowing a head loss of 5m and assuming efficiency of turbine and generator to be 90% and 95% respectively. Calculate suitable MW rating of the station. Comment also on the type of turbine to be installed. **(10 Marks)**

Section C

Question 5:

(a) Neatly draw and label a wind turbine power generating system **(6 Marks)**

(b) Describe the working principles of a wind turbine power generating system **(4 Marks)**

(c) State the Albert Betz's law for a hypothetical ideal wind-energy extraction machine **(1.5 Marks)**

(d) A wind turbine has the following parameters (Wind speed, 7m/s; cylindrical air density, 1.23kg/m^3; diameter of the rotor blade, 1.64m; rotor efficiency, 40%; transmission efficiency, 95%; generator efficiency, 90%. Determine (a) the total wind power in kW, (b) the maximum wind power in kW, (c) the mechanical power recovered at the rotor side, (d) at the transmission side, (e) electrical power output. **(6 Marks)**

Question 6:

(a) Is biomass termed as renewable energy sources? Yes/No, explain in brief. **(2.5 Marks)**

(b) Discuss the working principles of the utilization of biomass energy system. **(9 Marks)**

(c) State three (3) advantages and disadvantages of the utilization of biomass energy sources **(6 Marks)**

30·5
5·5
2
5
2·5
6
6

30·5
21·5
52
575
+12·5 + 12
127
57
84

P = W Q H X 9.81 x 10^3

(W)

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY(B. TECH): YEAR III DATE: 29/06/2022
EXAMINATION PAPER: EEE 361. (INTRO. TO RENEWABLE ENERGY) NO. OF STUDENTS: 250
2021/2022 SESSION – 1ST SEMESTER TIME ALLOWED: 2HRS
LECTURERS: [a]Engr. Dr. H.N. AMADI, [b]Engr E.K ORIE &[c]Engr. T. K. BALA, MAX. MARK: 70%
INSTRUCTION: **Answer a total of four questions.At least one question in each section and the remaining one question from any of the sections'unanswered questions.**
All questions carry equal marks

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

SECTION A

Question 1:

a) *With the aid of a pictorial diagram, explain the structure of a standalone photovoltaic system* **(5 marks)**

b) *Mention five (5) factors that affect the performance of solar PV systems* **(5 marks)**

c) *Mention and explain four (4) factors that affect solar panel efficiency* **(7.5 marks)**

Question 2:

a) *Explain the following terms:*
- *i) Short circuit current* **(2 marks)**
- *ii) Open circuit voltage* **(2 marks)**
- *iii) Maximum current* **(2 marks)**
- *iv) Maximum voltage* **(2 marks)**
- *v) Fill Factor* **(2 marks)**

b) *Define the followings:*
- *i) Battery bank* **(1 mark)**
- *ii) Tilt* **(1 mark)**
- *iii) Azimuth* **(1 mark)**
- *iv) Inverter* **(1 mark)**

c) *Consider a solar cell which parameters are Isc = 350A/m2, Voc = 0.6V, FF = 0.8 and irradiance for Pin = 1000W/m2. Calculate the efficiency.* **(3.5 marks)**

SECTION B

Question 3:

a) *State the mathematical formula for the power generated in watts of a tidal turbine, thus define what each parameter represents in the mathematical expression* **(3 marks)**

b) *Assume values for the parameters stated in a) for the Tidal Turbine, thus state in watts the power generated for a typical Tidal Turbine.* **(1.5marks)**

c) *State the major components and types of Tidal power plants , hence explain the process of power generation in any ?* **(4marks)**

d) *A Hydroelectric station is to be designed for the faculty of Engineering, Rivers state University to operate at a mean of 20500cm and supplied from a reservoir having a catchment area of 1.0 x*

10^{13} cm^2 with average annual rainfall of 125cm of which 75% is available for power generation. The expected load factor at the plant is 60%. Allowing a head loss of 500cm and assuming efficiency of turbine and generator to be 80% and 85% respectively. Calculate suitable MW rating of the station. suggest suitable turbine type to be installed. **(9marks)**

Question 4:

a) State two advantages Hydro energy has over other sources of renewable energies available **(2marks)**

b) Do a free hand sketch of the correct suggested suitable turbine type to be installed in (3d), hence give reason for your suggestion **(6.5marks)**

c)A hydroelectric station has a mean head of 7000cm receives inflow from a catchment area of 500km2 having an average rainfall of 100cm per annum. The rainfall occurs during the monsoon period of 90 days in a year. The storage capacity of the station is limited to half and total inflow. If 80% rainfall reaches the reservoir, determine the minimum capacity of the station. Assume that no head is lost in pipes etc. and the efficiency of the turbine and generator are 80% and 90% respectively. Determine also the total energy produced and plant use factor. **(9marks)**

SECTION C

Question 5:

(a) Neatly draw and label a three-blade horizontal-axis wind turbine **(3.5 marks)**

(b)Using the block diagram, describe the working operation of a wind turbine **(3.5 marks)**

(c) From given the equation $P_{out} = \frac{1}{2} P_{twp}(1 + x - x^2 - x^3)$, and $x = \frac{V_o}{V_i}$,Determine(i) the optimum value of x (ii) the maximum power recovered from the wind, (iii) if total wind power is 5.5kW, find $P_{out\,(max)}$. Also, determine the mechanical power(iv) at the rotor side, (v) at the transmissionside, (vi)electrical power output. Let the rotor efficiency, 40%; transmission efficiency,95% and generator efficiency, 90%.

(10.5 marks)

Question 6:

(a) What is biomass energy? **(1 marks)**

(b) State six sources of biomass energy. **(3 marks)**

(c) Draw the combustion block diagramof electricity generation powered by biomass.Discuss the utilization of biomass with regard to electricity generation. **(7.5 marks)**

(d) State and explain three (3) advantages and disadvantages of biomass energy utilization. **(6 marks)**

RIVERS STATE UNIVERSITY
NKPO'U-OROWORUKWO, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

\CHELOR OF TECHNOLOGY (B. TECH): YEAR III — DATE: 02/11/2020
:AMINATION PAPER: EEE 351 (ELECTRICAL MACHINES 1) — NO. OF STUDENTS: 150
)19/2020 SESSION – 1ST SEMESTER — TIME ALLOWED: 2.5HRS
:TURERS: ENGR. E.K. ORIE & ENGR. DAN HORSFALL — MAX. MARK: 70%
STRUCTION: ANSWER TWO (2) QUESTIONS FROM EACH SESSION, TOTALING FOUR (4) IN ALL

NITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR IATRICULATION NUMBER ON THE QUESTION PAPER. *Only scientific calculator is allowed*

ECTION A

Question One.

A) Describe the behavior of the following types of motors w.r.t. Speed - Torque, hence state two (2) application for each:
   i) Series motors (2marks)
   ii) Shunt motors (2marks)
   iii) Cumulative Compound motors (2marks)
   iv) Differential Compound motors (2marks)

B) A 4- pole wave wound DC Shunt generator runs at 1000rpm. When supplying 330 lamps each rated at 60W, 110V. It has a shunt field current of 2A. There are 90 commutator segments and brush width is equal to 1.1 Commutator segments. The self-inductance of each coil is 0.025mH. Determine the reactance Voltage if commutation is:
   i) Linear (5 marks)
   ii) Sinusoidal (4.5 marks)

Question Two.

A) Using free hand sketch , write briefly on:
   i) Lap winding. (5 marks)
   ii) Wave winding (5 marks)

B) Two DC Generators in RSU operating in parallel have linear characteristics. One machine has terminal voltage of 270V on no load and 220V at a load current of 30A. The other machine has a voltage of 280V on no load and 220V at 40A. Calculate the output current of each machine and the bus voltage when:
   i) The total load current is 50A. (4 marks)
   ii) The load resistance is 10Ω. (3.5 marks)

Question Three.

A) A Shunt Motor runs at 600 rpm, from 250V supply and takes a line current of 50A. Its armature and field resistances are 0.4Ω and 125Ω respectively. neglecting the effect of armature reaction allowing 2V brush drop calculate
   i) The no load speed, if the no load line current is 5A (5 marks)

II) The percentage reduction in the flux per pole in order the speed may be 800 rpm when the armature current is 40A. (5 marks)

B) A 500V Series Motor takes current of 180A to develop 80KW. The armature and series field resistances are 0.1Ω and 0.04Ω respectively. If the output is reduced to 40KW, find the efficiency and the input current of the motor. (7.5 marks)

SECTION B

Question One.

A) Briefly explain the followings:

I). Ratio Error or Voltage Error of Voltage Transformer (VT). (2marks)

II). Accuracy Limit Factor (ALF) of a Current Transformer (CT). (2marks)

III). Composite Error of a Current Transformer (CT). (2marks)

B). With the aid of coupling capacitor type voltage transformer (C.C.V.T) line diagram, calculate the capacitance requirement for a capacitive voltage transformer (CVT) to be used on a 132KV system,.feeding a 25MVA 132/33KV Delta-Star transformer. (Hint: Total capacitance of capacitor be 20,000pf, burden requirement is 100KVA and magnetic transformer designed for a standard primary voltage of $10/\sqrt{3}$KV). State two advantages of CVT over electromagnetic type VT. (5marks)

C). Briefly explain the following with reasons:

I). When Mr. Nelson Osah supplied 220Vdc to the primary of a Ø1 220/110Vac and what will be the value of inductive and capacitive reactance of the single phase transformer. (2marks)

II). And with the aid of transformer circuit diagrams when Mr. Friday Chijioke Kingsley short circuited the primary side and supplied a rated voltage to the secondary side of a single-phase transformer. What is the value of copper loss of same transformer when short-circuited? (Hint: A step-up transformer) (4.5marks)

Question Two.

A). The injection substation in Harmony Estate along Aba-Eliozu (Airforce) road, contained 2No.s 2.5MVA 33/11KV transformers of equal % impedance of 6.4% but unequal secondary voltage of 11.2KV and 11.0KV base on the setting of the tap-changer. Find the load shared by the transformer. Total load current is 250Amps. Determine the circulating current of the system and state the condition of the system (transformers) when parallel. (6marks)

3). The fault level at 33KV side of the 2.5MVA transformer is 130MVA, the 2.5mm^2 pilot cable is wired a listance of 50M between the secondary terminals of current transformer and the connected relays. The esistance of the 50M pilot cable is 0.1627Ω, the burden of the ABB50/51 (over current) relay is 1.8VA and he burden of ABB50N/51N earth fault relay is 4VA respectively. Determine standard CT as per IEC and stimate the following:

. the relay burden of the system.

). Fault current at CT installation (I_{sc}/I_m)

). Knee point voltage (V_K)

). Rated dynamic current (I_{dyn}) and complete specification for this protection.

C (I). State two main parts of a power transformer (2marks)

(II). State three most essential qualities required of the insulating oil. (3marks)

Question Three.

A). A 3Ø transformer found in RSU is 500KVA 11/0.45KV. Find the turn ratio if the transformer windings ar terminated as follows:

I). Star/Star (2marks)

II). Delta/Delta (2marks)

III). Star/Delta (2marks)

B). A single phase(1Ø), 10KVA 220/440V, 50Hz transformer gave the following test results:

Short Circuit	Open Circuit
30Volts	220Volts
22.73Amps	1.5Amps
100Watts	60Watts

I). Derive the Parameters for the approximate equivalent circuits referred to the low-voltage side and the high-voltage side. (2.5marks)

II). Express the excitation current as a percentage of the rated current and also determine the power factor for the nu-load and short-circuit test. (2marks)

III). Calculate applied voltage, voltage regulation and efficiency when the output is 8A at 440V and 0.8 power factor lagging. (2marks)

C). Calculate the fault MVA and estimate the rating of SF6 circuit breaker to be used at the 33kv bus level as shown in Fig 3c (Assume 100MVA Base) (5marks)

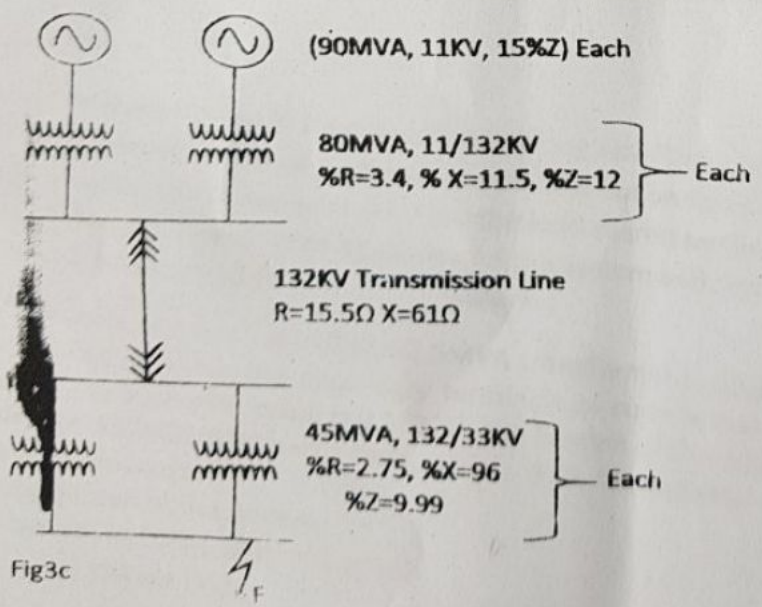


Fig3c

SECTION B (2021)

Question One (37.5mins)

A). Explain the followings using Current Transformer (CT) characteristic diagram:

I). Angle point **(2marks)**

II). linear or straight region **(2marks)**

III). knee point **(2marks)**

B). A 3Ø transformer found in Forcados SPDC, is 25MVA 11/33KV. Find the turn ratio if the transformer windings are terminated as follows:

I). Star/Star **(2marks)**

II). Delta/Delta **(2marks)**

III). Star/Delta **(2marks)**

A). The injection substation in Forcados Terminal, contained 2No.s 25MVA 11/33KV transformers of equal % impedance of 10% but unequal secondary voltage of 33.2KV and 33.0KV base on the setting of the tap-changer. Find the load shared by the transformer. Total load current is 873Amps. Determine the circulating current of the system and state the condition of the system (transformers) when parallel. **(5.5marks)**

Question Two (37.5mins)

A) (I). State six essential qualities required of transformer insulating oil (3marks)

(II). State three methods for carrying out parallel operation checks on high voltage system. (3marks)

B). The fault level at 11KV side of the 25MVA transformer is 145MVA, the 2.5mm^2 pilot cable is wired a distance of 25M between the secondary terminals of current transformer and the connected relays. The resistance of the 25M pilot cable is 0.1627Ω,

the burden of the ABB SPAJ 140C-50/51 (over current) relay is 1.8VA and the burden of ABB SPAJ 110C 50N/51N earth fault relay is 4VA respectively. Determine standard CT as per IEC and estimate the followings (Assume CT resistance to be 0.605Ω):

I). the relay burden of the system.

II). Fault current at CT installation (I_{SC}/I_{TH})

III). Knee point voltage (V_K)

IV).Rated dynamic current (I_{dyn}) and complete specification for this protection. **(6.5marks)**

C). With the aid of transformer short-circuit diagram and mathematical expression explain percentage impedance (%Z) of a single phase transformer. **(5marks)**

Question Three (37.5mins).

A) (I). Name three recognized cooling methods for transformers **(3marks)**

II). State four (4) routine power transformer test. **(2marks)**

B). Find the load shared by 2 No.s of 11/33KV 25MVA transformer of equal rating but with unequal % impedances of 10% and10.2%. **(5marks)**

B). A single phase(1Ø), 2.2KVA 230/115V, 50Hz transformer gave the following test results:

Short Circuit	Open Circuit test
19.1Volts	230 Volts
8.7 Amps	0.45Amps
42.3 Watts	30Watts

I). Derive the Parameters for the approximate equivalent circuits referred to the high-voltage side. **(4marks)**

II). Express the excitation current as a percentage of the rated current and also determine the power factor for the nu-load and short-circuit test. **(3.5marks)**

$E = I_{se} +$

$E = I_a R_a +$ ✓

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B. TECH): YEAR III
EXAMINATION PAPER: EEE 371/351(ELECTRICAL MACHINES 1)
2021/2022 SESSION – 1ST SEMESTER
LECTURERS: ENGR. KENNETH EZE ORIE & ENGR.DR. DAN HORSFALL
INSTRUCTION: ANSWER ANY TWO (2) QUESTION OF YOUR CHOICE FROM EACH SECTION, TOTALING FOUR (4) IN ALL. ALL QUESTION CARRY EQUAL MARK

DATE: 15/07/2022
NO. OF STUDENTS: 250
TIME ALLOWED: 2HRS
MAX. MARK: 70%

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT. DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER. Only scientific calculator is allowed

SECTION A

QUESTION ONE

A) What is a D.C. generator and state the types of D.C. generator you know $2\frac{1}{2}$mks

B) Using Hobart's formula, derive the mathematical expression for the coefficient of self-inductance L and reactance voltage, hence comment on your result 5mks

C) A 2-pole D.C. shunt generator charges a 100V battery of negligible internal resistance. The armature of the machine is made up of 1000 conductors, each of 2 milli-ohm resistance respectively. Find the field current resistance and flux per pole of the generator. Neglect armature reaction effects. 5mks

D) A series generator having a combined armature and field resistance of 0.4Ω is running at 1000 r.p.m. and delivering 5.5kW at a terminal voltage of 110V, if the speed is raised to 1500 r.p.m. and load adjusted to 10Kw, find the new current and terminal voltage. Assume the machine is working on the straight line portion of the magnetization characteristic

$P = E_b I_a$ 5mks

QUESTION TWO

E) Using mathematical equation only differentiate between a D.C. generator and a D.C. motor

A) $1\frac{1}{2}$mks

B) Sketch the graph of shunt generator load characteristics, hence indicate the following points in the graph 3mks

i) Eg at no load ii) Rated load current iii) Armature reaction voltage drop iv) IaRa voltage drop v) Drop owing to decreasing If vi) Break down point 3mks

C) State serially the procedures adopted in determination of internal characteristics from external characteristics using X,Y coordinates , hence do a free hand sketch of such plot. 5mks

D) A 4-pole D.C. generator has an interpole air gap of 0.01m and 704 lap wound armature conductors. The flux density in the interpole air gap is 0.42Wb/m. if it delivers 308kW at 440V, determine the number of turns needed on each interpole. The effect of iron parts of the circuit and of leakage may be ignored. 5mks

QUESTION THREE

A) Two shunt generators with straight line characteristics are operated in parallel, their no-load voltage being 240V and 245V. if the total load supply is 650kW. Calculate the terminal voltage and the power supplied by each machine in Kw 4mks

B) Two D.C. shunt generators with e.m.fs of 120V and 115V, armature resistances of 0.005Ω and 0.04Ω and field resistances of 20Ω and 25Ω respectively are in parallel supplying a total load of 25kW. How do they share the load? 4mks

C) A 230V, 1000 r.p.m. D.C. shunt motor has field resistance of 115Ω and armature circuit resistance of 0.5Ω. at no load the motor runs at 1000 r.p.m. with armature current of 4A and with full field flux

i) For a developed torque of 80Nm. Compute armature current and speed of the motor

ii) If it is desired that motor develops 8Kw at 1250 r.p.m., determine the value of external resistance that must be inserted in series with the field winding, saturation and armature are neglected. 2mks

D) A 230V D.C. shunt motor has an armature circuit resistance of 0.4Ω and field resistance of 115V. this motor drives a constant load torque and takes an armature current of 20A at 800 r.p.m. if the motor speed is raised from 800 $2\frac{1}{2}$mks

to 1000 r.p.m., find the resistance that must be inserted in the shunt field circuit. Assume magnetization curve to be a straight line. 5mks

SECTION B

QUESTION ONE

A). Briefly explain the followings:

I). Rated Short Time Thermal Current (I_{th}) of a Current Transformer (CT). (2marks)

II). The relationship between Accuracy Limit Factor (ALF) and Instrument Security Factor (ISF) of a Current Transformer (CT). (2marks)

III). Rated Dynamic Current (I_{dyn}) of a Current Transformer (CT). (2marks)

B). With the aid of trigonometry diagram, prove that the line voltage (V_A) = $\sqrt{3}$ × phase voltage (V_a) in Star-Delta/Delta-Star phase shift of a power system and also sketch the phasor diagram to show that the line voltage is displaced from the phase voltage by 30° in all the phases. (5marks)

C) (i). In a three-phase 4-wire 415/240Volts system, a lamp of 100Watts is connected to red & neutral and second lamp of 200Watts is connected to neutral & yellow line. Calculate the voltage across each lamp when neutral line is disconnected.
(2marks)

II). Three identical coils are connected in Star to a 400V (line voltage), three phase A.C supply and each coil takes 300W. if the power factor is 0.8 (lagging). Calculate the current, the impedance and the reactance & resistance. (4.5marks)

QUESTION TWO

A). A 230/115V single-phase transformer takes a no-load current of 2A at a power factor of 0.2 lagging with low voltage winding kept open. If the low voltage winding is now loaded to take a current of 15A at 0.8PF lagging. Find the current taken by high voltage winding.
(6marks)

B). The secondary of a 3Ø star-connected transformer, which has a phase voltage of 230V feeds a 3Ø delta-connected load; each Ø of which has a resistance of 30Ω and an inductive reactance of 40Ω. Draw the circuit diagram of the system and calculate:

I). the voltage in each phase of load

II). the current in the phase of load

III). the current in the transformer secondary windings and

IV). the total power taken from the supply and its power factor. (6.5marks).

C (I). State two main causes of a low power factor in a power system. (2marks)

(II). State three most essential equipment(s) which can improve power factor. (3marks)

QUESTION THREE

A (I). State six cooling methods of a power transformer. (3 marks)

(II). Briefly explain any of the three cooling methods of a power transformer. (3marks)

B). A single phase(1Ø), 10KVA 220/440V, 50Hz transformer gave the following test results:

Short Circuit	Open Circuit
30Volts	220Volts
22.73Amps	1.5Amps
100Watts	60Watts

I). Derive the Parameters for the approximate equivalent circuits referred to as the low-voltage side and the high-voltage side. (2.5marks)

II). Express the excitation current as a percentage of the rated current and also determine the power factor for the no-load and short-circuit test. (2marks)

III). Calculate applied voltage, voltage regulation, and efficiency when the output is 8A at 440V and 0.8 power factor lagging. (2marks)

C). A balanced star-connected load (8+ j6) Ω/phase is connected to a 3Ø, 230Volts, 50Hz supply. Find the current, power factor, volt-ampere and reactive power. Draw the phasor diagram for the above circuit. (5marks)

GOODLUCK EVEN AS YOU MACHINE IT OUT USING YOUR MACHINERIES

DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of Technology (B. Tech): Year III **Date: 06/11/2020**

Examination Paper: EEE-371. (Electrical Engineering Laboratory 1)

2019/2020 Session – 1ST Semester **No. of Students: 200**

Lecturers: Mr. B. Deesor, Mr. U.S. Okogbule& Mr. I.S. Abam **Time Allowed: 2hrs**

Instruction: Answer Question 5 and any other 4. **Max. Mark: 70%**

All questions carry equal marks

Switch off all phones and keep them out of sight. Do not write anything except your matriculation number on the question paper. Only scientific calculator is allowed

Question 1

(a) Explain briefly the practical steps taking when carrying out continuity test on a life wire. (5Marks)

(b) State three precautions taking to avoid electric shock when walking on a life wire. (4Marks)

(c) What are the practical steps taken when using a multimeter in troubleshooting a simple diode circuit. (5Marks)

Question 2

(a) What is an oscilloscope? (3Marks)

(b) Mention four uses of an oscilloscope. (4Marks)

(c) Explain the practical steps taking when using an oscilloscope in measuring voltage. (7Marks)

Question 3

(a) Mention four precautions taking when carrying out Kirchhoff's voltage law (KVL). (6Marks)

(b) State the specific aim of Ohm's law when carrying out the experiment (2Marks)

(c) List four observation taking when carrying out Ohm's law experiment. (6Marks)

Question 4

(a) What is laboratory safety? (4Marks)

(b) List three factors that can contribute to a safe laboratory (5Marks)

(c) What do you understand by the word First Aid? (5Marks)

Question 5

(a) Draw the diagram of a regulated power supply. (5Marks)

(b) Label the various components in the diagram of question (4a) above and connect a center-tap transformer to the negative line. (5Marks)

(c) From the diagram drawn in question 4a above, indicate the point where you can measure your $V_d(ac)$ and state possible $V_d(ac)$ voltage which can be gotten from it. (4Marks)

Question 6

(a) Give three reasons why the positive terminal of a diode is so important (5Marks)

(b) Explain what is meant by the word pulsating DC (5Marks)

(c) What is the basic difference between a half wave and a full wave rectifier (4Marks)

Question 7

(a) What are the three-dope region within a bipolar junction transistor (6Marks)

(b) Show that $\propto_{DC} = \frac{B_{DC}}{1+B_{DC}}$ (8Marks)

NKPOLU-OROWORUKWO, PORT HARCOURT

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF TECHNOLOGY (B.TECH.): YEAR III DATE: 8/9/2021

COURSE CODE: EEE 371 COURSE TITLE: ELECTRICAL LABORATORY I

SESSION: 2020/2021 SEMESTER: FIRST (1^{ST}) TIME: 2 HOURS

LECTURERS: Engr. L. Dumkhana, Mr. Chemkei Agbara, Engr. F.C. Ichenwo, Mr. N. Ugochukwu

INSTRUCTION: Answer Three Questions Only. 30marks. No of students: 200

SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT!!!!

1. Name 2 Classifications of electronic Components and briefly explain them. [3 MKS]
   a) Give examples of the 2 classification of electronic components. [1 MKS]
   b) In a 4-band color code of a resistor, what does the 3rd and 4th band represents? [1 MK]
   c) Resistors have tolerance, which are classified in ±%, name the 4 (~~seven~~ four) of them and their colour codes. [2MKS]
   d) What is the colour code of a 333kΩ, ±5% five band resistors?[1MK]
   e) What is the value of a 4-band resistor which has the first band -- Green, the second band – blue, the third band - orange, the fourth band – Gold? [1MK]
   f) In a 6 band colour code of a resistor, what does the 6th band represent? [1MK]

2. Name 6 (six) apparatus used in the experiment to determine the characteristics of a diode. [3MKS]
   a) Name 4 (four) applications of a diode [2MKS]
   b) Draw a simple circuit diagram you used to carryout the experiment to determine the characteristics of a diode. Use R_1 =1kΩ, D_1 = 1N914 [1MKS]
   c) Sketch the graphical representation of the characteristic of a diode in forward bias [1MK]
   d) With the simple table of valuesof the characteristic of a diode below;
      i. Calculate I_R and indicate the S.I unit? [1 MK]
      ii. What does the following V_S, V_R, V_D and I_R stand for and indicate their unit? [1MK]

NO	1	2	3	4	5
V_S	-5	-4	-3	-2	-1
V_R	4.33	3.35	2.37	1.14	0.48
V_D	0.64	0.63	0.61	0.59	0.53
I_R	?	?	?	?	?

   e) Diodes have terminals; True or False?If true, name the terminals with the aid of a diagram. If false, explain why. [1MK]

3. Name the apparatus used in the transistor experiment and what was your aim of the experiment? [1MK]
   a) Draw a simple circuit diagram you used to carry out the experiment of a transistor use; R_1 = 1kΩ, R_2 = 5KΩ and R_3 = 10kΩ, T_1 = 1N2222. [1MK]
   b) Name 4 (four) applications of a transistor. [1MK]

d) With this simple table of values from the experiment of a transistor you carried out in the lab;

iii. Calculate the HFE and define it. [3MKS]

iv. What does the following V_S, V_B, V_C, V_E, V_{BE}, V_{CE}, I_B, I_C, and I_B stand for, and their S.I Units [3MKS]

NO	1	2	3	4	5	6	7	8
V_S	0.00	0.3	0.6	0.9	1.2	1.5	1.8	2.4
I_E	0.00	0.00	0.05	0.15	0.2	0.81	0.85	0.95
I_C	0.00	0.03	0.59	0.87	1.15	1.44	1.74	2.02
I_B	0.00	0.03	0.06	0.09	0.12	0.15	0.18	0.21
Hfe	?	?	?	?	?	?	?	?

4. Define Kirchoff's Voltage Law (KVL) and what was the aim of the (KVL) experiment you carried out in the lab? [3MKS]

a) Draw a simple circuit diagram you used to carryout (KVL) experiment, use R_4 = 5.1kΩ, R_5 = 1kΩ [1MK]

b) From the table of values; determine V_S using (KVL) formula. [1MK]

V_S	R_4	R_5
	4.15	0.85
	8.30	1.70

c) During the course of carrying the (KVL) experiment, Explain in details;Your observations/results and Your conclusions [1MK]

d) Define Kirchoff's Current Law (KCL) and what was the aim of the (KCL) experiment you carried out in the laboratory. [2MK]

e) Draw a simple circuit diagram you used to carryout (KCL) experiment, use R_4 = 5.1kΩ, R_5 = 1kΩ [1MK]

f) From the table of values, determine I_T using the first (KCL) formula and apply/state the corresponding S.I Unit. Using the 2nd formula, verify and prove (KCL). [1MK]

I_T	I_{R4}	I_{R5}
	0.50	2.50
	0.67	3.33

5. (a) State the main causes of accident in an electrical workshop. (1-mks)

(b) Define the followings:

i. the true reading of the meter [1-mks]

ii. the multiplication factor of the meter. [2 mks]

(c) Calculate the true reading of a multimeter if the reading on the meter is 20, the range setting is 120 and the maximum scale reading is 30. [2-mks]

(d) Stipulate the precautions necessary when using a d.c. meter for measuring electrical quantities. [1-mks]

(d) With neat sketches, show how ammeters, voltmeters, and single-phase watt-meters are connected in circuits. [3-mks]

RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT
DEPARTMENT OF ELECTRICAL ENGINEERING

Bachelor of Technology (B. Tech): Year III — **Date: 13/07/2022**
Examination Paper: EEE 371. (Electrical Laboratory I) — **No. of Students: 150**
2021/2022Session – 1st Semester — **Time Allowed: 3 HRS**
Lecturers: Engr. L. Dụmkhana, Mr. C. Agbara, Engr. F. C. Ichenwo&Mr. N. Ugochukwu — **Max. Mark: 70%**
Instruction: Answer a total of four questions. All questions carry equal marks

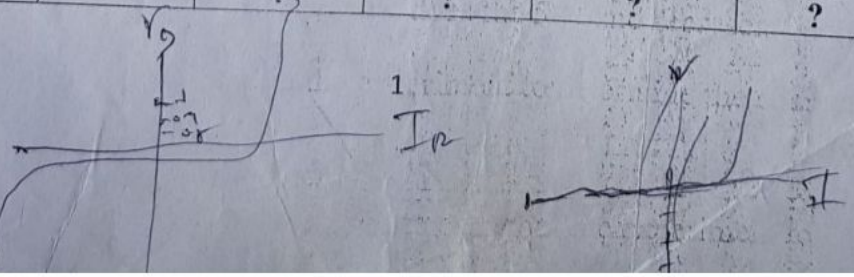
SWITCH OFF ALL PHONES AND KEEP THEM OUT OF SIGHT.DO NOT WRITE ANYTHING EXCEPT YOUR MATRICULATION NUMBER ON THE QUESTION PAPER.ONLY SCIENTIFIC CALCULATOR IS ALLOWED

1(a) Name 2 Classifications of electronic components and briefly explain them. **(6MKS)**
(b) Give examples of the 2 classification of electronic components. **(2MKS)**
(c) In a 4- band color code of a resistor, what does the 3rd and 4th band represents? **(2MKS)**
(d) Resistors have tolerance, which are classified in ±%, name the 7 (seven) of them and their colour codes. **(2MKS)**
(e) What is the colour code of a 330kΩ, ±5% five band resistors. **(2MKS)**
(f) What is the value of a 4-band resistor which has the first band- Green, the second band-blue, the third band –orange, the fourth band –Gold? **(2MKS)**
(g) In a 6 band colour code of a resistor, what does the 5th band represent? **(1.5MKS)**

Black 0
Brown 1
red 2
orange 3
yellow 4
green 5
blue 6
violet 7
grey 8
white 9
gold
one

2(a) Name 6 (six) applications used in the experiment to determine the characteristic of a diodes. **(6MKS)**
(b) Name 4 (four) applications of a diode **(2MKS)**
(C) Draw it simple circuit diagram you used to carry out the experiment to determine the characteristics of a diode. Use R_t=1kΩ, D_t=tN914 **(4MKS)**
(d) Sketch the graphical representation of the characteristic of a diode in forward bias **(2MKS)**
(i) With the simple table of values of the characteristic of a diode below; Calculate I_R and indicate the S. I. unit? **(1MKS)**
(ii) What does the following V_S, V_R, V_D and I_R stand for and indicate their unit? **(1MKS)**

No	1	2	3	4	5
V_S	−5	−4	−3	−2	−1
V_R	4.33	3.35	2.37	1.14	0.48
V_D	0.64	0.63	0.61	0.59	0.53
I_R	?	?	?	?	?



(e) Diodes have terminals; True or False? If true, name the terminals with the aid of a diagram. If false, explain why? **(1.5 MKS)**

3(a) Name the apparatus used in the transistor experiment and what was your aim of the experiment? **(6MKS)**

(b) Draw a simple circuit diagram you used to carry out the experiment of a transistor use, R_1 =1kΩ, R_2 =5kΩ and R_3 =10kΩ, T_1 =IN2222 **(3MKS)**

(c) Name 4 (four) applications of a transistor **(2MKS)**

(d) Sketch the graphical representation of the experiment transistor **(3MKS)**

(e) With this simple table of values from the experiment of a transistor you carried out in the lab;

(i) Calculate the HFE and define it **(3MKS)**

(ii) What does the following V_S, V_B, V_C, V_E, V_{BE}, V_{CE}, I_E, I_C, and I_B Stand for, and their S.I Units **(2MKS)**

No.	1	2	3	4	5	6	7	8
V_S	0.00	0.3	0.6	0.9	1.2	1.5	1.8	2.4
I_E	0.00	0.00	0.05	0.15	0.2	0.81	0.85	0.95
I_C	0.00	0.03	0.59	0.87	1.15	1.44	1.74	2.02
I_B	0.00	0.03	0.06	0.09	0.12	0.15	0.18	0.21
HFE	?	?	?	?	?	?	?	?

4(a) Define Kirchoff's voltage law (KVL) and what was the aim of the (KVL) experiment you carried out in the lab? **(4MKS)**

(b) Draw a simple circuit diagram you used to carry out (KVL) experiment use R_4 = 5.1 kΩ, R_5=1kΩ **(4MKS)**

(c) From the table of values; determine V_S using (KVL) formula **(4MKS)**

V_S	R_4	R_5
	4.15	0.85
	8.30	1.70

(e) During the course of carrying the (KVL) experiment, Explain in details; your observations/results and your conclusions **(2MKS)**

(f) Define Kirchoff's Current Law (KCL) and what was the aim of the (KCL) experiment you carried out in the laboratory. **(2MKS)**

(g) Draw a simple circuit diagram you used to carryout (KCL) experiment, use R_4= 5.1 kΩ, R_5=1kΩ **(4MKS)**

(h) From the table of values, determine IT using the first (KCL) formula and apply/state the corresponding S.I unit the 2nd formula, verify and prove (KCL). **(1MKS)**

IT	I_{R4}	I_{R5}
	0.50	2.50
	0.67	3.33

5(a) State the main causes of accident in an electrical workshop **(4MKS)**

(b) Define the followings:

i) The true reading of the meter **(1MK)**

ii) The multiplication factor of the meter **(2MKS)**

(c) Calculate the true reading of a multimeter if the reading on the meter is 20, the range setting is 120 and the maximum scale reading is 30 **(2.5MKS)**

(d) stipulate the precaution necessary when using a DC meter for measuring electronic equipment. **(2MKS)**

(e) with neat sketches, show how ammeters, voltmeters, and single-phase watt-meters are connected in circuits. **(6MKS)**

6 (a) What is regulated power supply? **(1mk)**

(b) Draw a regulated power supply circuit diagram used during your practical and indicate the meter point of $V_{d(ac)}$, $V_{d(dc)}$, Output (ac) and Output (dc) **(6mks)**

(c) Explain the main function a step-down transformer, rectification, DC filtration and regulator **(4MKS)**

(d) During the course of carrying the experiment on regulated power supply. Explain in details; your observations/results and your conclusions **(4MKS)**