



COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

**PROGRAMME: CERTIFICATE IN RADIO, ELECTRONICS AND TELEVISION
SERVICEMAN-STAGE 1**

UNIT CODE: EEE201

TITLE: BASIC ELECTRONICS

FINAL EXAMINATION – PENSTER 2, 2017

**ROOM: AS PER TIMETABLE
TIME: 2 HOURS 10 MINUTES**

INSTRUCTIONS TO STUDENTS

1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each **SECTION** on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and **ATTACH** these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. **ANSWER ALL QUESTIONS**
9. Show all working where necessary.
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

SECTION A

MULTIPLE CHOICE

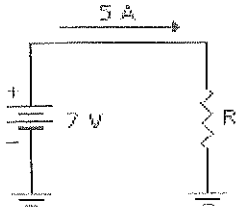
(20 MARKS)

Choose the appropriate answer from each question by writing the alphabet beside the question number:

1. Protons have _____.
 - A. negative charge
 - B. positive charge
 - C. neutral charge
 - D. one charge
2. 1 KWh is equivalent to:
 - A. 1000 KJ
 - B. 1000 MJ
 - C. 360 MJ
 - D. 3.6 MJ
3. Which of the following is not a basic SI unit?
 - A. metre
 - B. kilogram
 - C. Newton
 - D. second
4. Materials that oppose the flow of electrons are known as _____.
 - A. insulators
 - B. conductors
 - C. semi-conductors
 - D. none of the above
5. The prefix micro means
 - A. 10^{-3}
 - B. 10^{-6}
 - C. 10^{-9}
 - D. 10^{-12}
6. Any voltage above is generally considered to be capable of delivering dangerous shock currents.
 - A. 10V
 - B. 20V
 - C. 30V
 - D. 50V
7. What is the capacitance of a ceramic capacitor with *103* stamped on it?
 - A. 103pF
 - B. 10nF
 - C. 1pF
 - D. 10pF

8. What is the value of this resistor which has the following colour code combination... brown, black, red, gold
- A. $100\Omega \pm 5\%$.
 - B. $1k\Omega \pm 5\%$.
 - C. $10k\Omega \pm 5\%$.
 - D. $1k\Omega \pm 10\%$.
9. Which of the following magnetic poles will attract each other?
- A. North and South
 - B. Positive and Negative
 - C. South and South
 - D. North and North
10. What is the magnetomotive force in a 150-turn coil of wire with 2A flowing through it?
- A. 75 At
 - B. 152 At
 - C. 13.33 mA
 - D. 300 At
11. When connecting silicon diodes into a circuit, how much voltage you will need to turn the diode on
- A. 0.3V
 - B. 5V
 - C. 0.7V
 - D. 10V
12. Which component stores electric charge?
- A. Resistor
 - B. Inductor
 - C. Transformer
 - D. Capacitor
13. In any parallel circuit:
- A. Voltage is same
 - B. Current is same
 - C. Resistance is same
 - D. All of the above

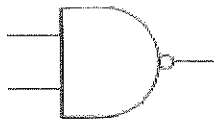
14.



What is the power in the given circuit?

- A. 35 W
- B. 3.6 W
- C. 245 W
- D. 175 W

15. Identify the following logic gate?



- A. NOR Gate
- B. NAND Gate
- C. EX-OR Gate
- D. NOT Gate

16. If a fuse blows, and it is replaced with one having a lower current rating, there's a good chance that:

- A. The power supply will be severely damaged.
- B. The diodes will not rectify.
- C. The fuse will blow out right away.
- D. Transient suppressors won't work.

17. How many diodes is/are required in a full wave bridge rectifier circuit?

- A. 1
- B. 2
- C. 4
- D. 8

18. The Boolean expression for a three-input AND gate is:

- A. ABC
- B. A+B+C
- C. A+BC
- D. AB +C

19. Ohm's law is a relationship between

- A. voltage, current, and time
- B. power, current, and resistance
- C. resistance, time, and current
- D. voltage, current, and resistance

20. Ammeters are always connected in:

- A. series
- B. parallel
- C. direct
- D. series/parallel

SECTION B

TRUE OR FALSE

[10 MARKS]

Write either TRUE or FALSE for the correct answer.

1. The binary number for decimal number 25 is 11010.
2. The decimal number for the binary number 101101 is 45.
3. The mathematical expression used to describe 2 input OR gate is $A \times B = X$.
4. Like charges repel and unlike charges attract.
5. Conductors have plenty of free electrons.
6. Kirchhoff's Current Law (KCL) states that the sum of currents entering a node of junction is not equal to the sum of current leaving the same junction.
7. The invisible force of magnetism is referred to as a magnetic field.
8. Step down transformers are where the voltage induced in the secondary circuit is greater than that applied to the primary circuit.
9. The term thyristor refers to a family of four layer p-n-p-n semiconductor switching devices.
10. The values in a variable capacitor cannot be changed.

SECTION C

FILL IN THE BLANKS

[10 MARKS]

Fill in the Blanks by drawing the circuit symbol and the function of the component in the Circuit.

COMPONENT	CIRCUIT SYMBOL	FUNCTION IN THE CIRCUIT
a). NPN Transistor		
b). Triac		
c). Inductor		
d). Capacitor		
e). Diode		

SECTION D

SHORT ANSWER QUESTION

[30 MARKS]

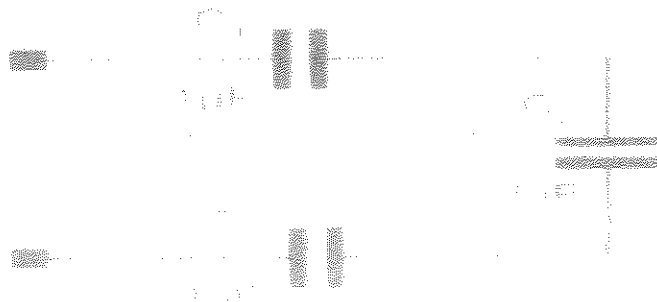
1. What is the maximum number of electrons that is supposed to be in the first shell of an atom? (1 mark)
2. Draw the basic atomic structure of Aluminum atom with atomic number = 13 and state whether Aluminum is a good conductor, semi-conductor or an insulator? (3 marks)
3. Sketch the flow diagram of a basic power supply and briefly explain the main processes that take place before a good, clean DC voltage is produced. (8 marks)
4. Determine the logic gate symbol and the truth table for a 2 input:
A. OR gate (3 marks)
B. NAND gate (3 marks)
5. Draw the circuit diagram of a single phase full wave bridge rectifier circuit and show the waveform diagram. (5 marks)
6. Differentiate between analog and digital signals? (2 marks)
7. Explain the following types of transformers: (3 marks)
a. Power transformer
b. Auto transformer
c. Audio frequency transformers (a.f)
8. Give 2 applications of flip flops? (2 marks)

SECTION E

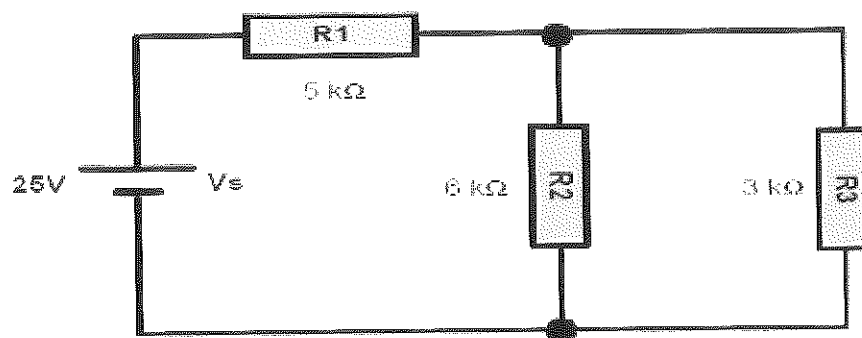
CALCULATIONS-SHOW ALL YOUR WORKING

[30 MARKS]

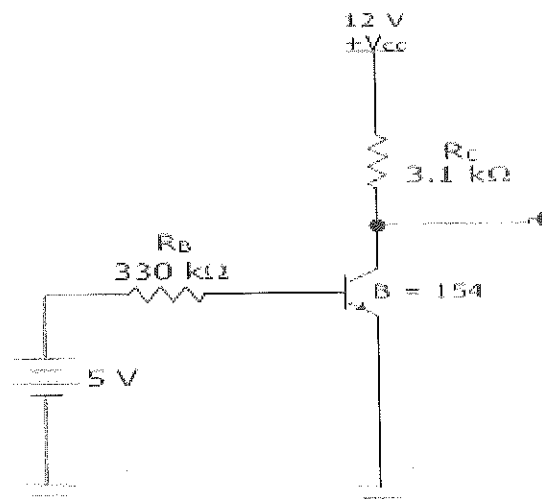
1. For the circuit shown below, calculate the following:
a) Total capacitance of the circuit (2 marks)
b) How much charge does the circuit take when it's connected to a 50V DC supply? (2 marks)



2. Determine the values and tolerance range of given resistors:
- i). orange, green, red, gold [4 band] (2 marks)
 - ii). blue, red, black, orange, red [5 band] (2 marks)
3. From the series-parallel circuit below, determine the following :
- a. Total resistance (1 mark)
 - b. Total current (1 mark)
 - c. Voltage drop across each resistor (2 marks)
 - d. Branch current flowing in R_2 and R_3 (2 marks)

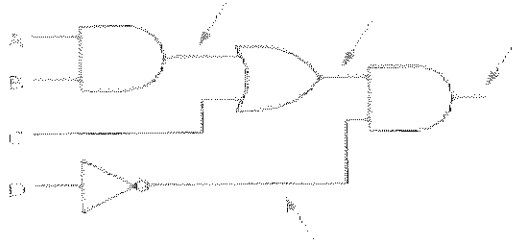


4. List down the 4 types of transistor biasing methods. (2 marks)
5. A silicon transistor having $\beta = 154$ is shown below:



- For the circuit show above, determine the following:
- a) I_B (2 marks)
 - b) I_C (2 marks)
 - c) I_E (2 marks)
 - d) V_{CE} (2 marks)

6. Convert the following logic gate circuit into a Boolean expression, writing Boolean sub-expressions next to each gate output in the diagram: (2 marks)



7. Convert the decimal number 13_{10} to binary. (2 marks)
8. Convert the binary number 10011_2 to decimal number. (2 marks)

*****THE END*****

Appendix-1

FORMULAE TABLE

1. $V = IR$

2. $C_T = C_1 + C_2 + C_3$

3. $T = RC$

4. $T = L/R$

5. $V_E = V_B - 0.7$

6. $V_{BE} = 0.7V$

7. $V_{RS} = V_{CC} - 0.7$

8. $Q = CV$

9. $V_C = V_{CC} - I_C R_C$

10. $1/R_T = 1/R_1 + 1/R_2 + 1/R_3$

11. $R_T = R_1 + R_2 + R_3$

12. $V_{CE} = V_C - V_{EC}$

13. $1/C_T = 1/C_1 + 1/C_2 + 1/C_3$

14. $I_B = \frac{(V_{CC} - V_{BE})}{R_B}$

15. $I_C = \beta I_B$