



UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER TWO EXAMINATIONS
ACADEMIC YEAR 2023/2024

DEPARTMENT : ICT/ENGINEERING

SEMESTER : TWO

PROGRAMME(S) : HIGHER EDUCATION CERTIFICATE ENGINEERING (HECE)

YEAR OF STUDY : ONE

COURSE : INTRODUCTION TO ELECTRONICS

COURSE CODE : HECE 125

DATE : SUNDAY, 30/06/2024

TIME : 2:00 PM – 5:00 PM

DURATION : 3 HOURS

INSTRUCTIONS:

- (i) This paper contains two Sections: A (40 marks) & B (60 marks).**
- (ii) Attempt ALL questions in Section A, and ONLY THREE questions in Section B.**
- (iii) All questions in Section B carry equal marks.**
- (iv) Credit will be given for use of relevant examples and illustrations.**
- (v) Begin each number in Section B on a new page of the answer sheet.**
- (vi) DO NOT write on this question paper.**

SECTION A (20 MARKS)

Attempt **ALL** the Questions in this Section.

OBJECTIVES (Select the most correct answer)

1. Which of the following are examples of active devices?
a) Capacitors and Transistors b) Vacuum and Resistors c) TRIACS and SCRS d) None
2. Select a combination of bands which are commonly used to calculate the mantissa of resistors?
a) Gold and Silver b) Green and Blue c) Silver and Black d) Gold and Orange
3. Which combinations of bands are commonly used to calculate the tolerance of resistors?
a) Gold and Silver b) Green and Blue c) Silver and Black d) Gold and Orange
4. State the most appropriate S.I units usually used to measure capacitance in electronics analysis?
a) F & nF b) μF & nF c) μF & F d) pF & F
5. Calculate the capacitance of the capacitor having dimensions, 30 cm X 40 cm and separated with a distance $d = 8\text{mm}$ air gap.
a) 1.2F b) 0.13275 nF c) 4.2 pF d) 0.1567 nF
6. Which of the following factor is not considered when determining inductance of a coil
a) Number of wraps b) Potential difference c) Coil Area d) Coil length
7. The following is **NOT** a contact type of relays;
a) SPST b) SSSP c) SPDT d) DPST
8. Valence electrons determine which properties of a material;
a) Chemical and mechanical b) Physical and electricity c) Chemical and Physical
9. Which of the following electronic devices operate by virtue of the movement of electron within a semi-conductor material.
a) Transistor b) Junction diode c) Solid state devices d) Each of the above
10. What determines whether a solid material will act as a conductor, a semi-conductor or an insulator?
a) The energy level of the valence band.
b) The energy level of the conduction band.
c) The energy difference across the forbidden gap.
d) The actual construction of the valence electrons
11. When a pentavalent impurity is added to a pure semi-conductor, it becomes
a) Insulator b) an intrinsic semi-conductor c) P-type semi-conductor d) N-type semi-conductor
12. If a certain Zener diode has a Zener voltage of 3.6V, it operates in;
a) Regulated breakdown b) Zener breakdown c) Forward conduction d) Avalanche breakdown
13. Which of the following conditions presents the greatest danger to a transistor?
a) High operating voltage b) Heat c) Excessive reverse current d) Handling of the transistor.
14. What is the main classification of oscillators in modern physics of solid-state devices?
a) Conduction and non-conduction b) Alternating and Direct c) Sinusoidal and non-sinusoidal
15. The following is a generation of ICs, apart from?
a) SSI b) MSI c) LSI d) VLSI e) ULSI f) UEFI

SHORT ANSWERS

1. State the difference between Real and Ideal sources **(2 Marks)**
2. Give two examples of both passive and active components **(4 Marks)**
3. A wire of length 8m and cross-sectional area 3mm^2 has a resistance of 0.16Ω . If the wire is drawn out until its cross-sectional area is 1mm^2 , determine the resistance of the wire. **(3 Marks)**
4. State any two features that are considered when choosing a relay for any application. **(2 Marks)**
5. Define Electron Emission as well as Work function? **(2 Marks)**
6. What is the Doping process and recombination process? **(2 Marks)**
7. What is the difference between an intrinsic and extrinsic semi-conductor? **(2 Marks)**
8. Define the difference between Acceptor and Donor impurities, list two examples respectively. **(4 Marks)**
9. What are the majority carriers in N-type and P-type semi-conductors respectively? **(2 Marks)**
10. State any two precautions that should be taken to prevent damage to transistors. **(2 Marks)**

SECTION B (20 MARKS)

Attempt **ONLY THREE** Questions in this Section.

Question One:

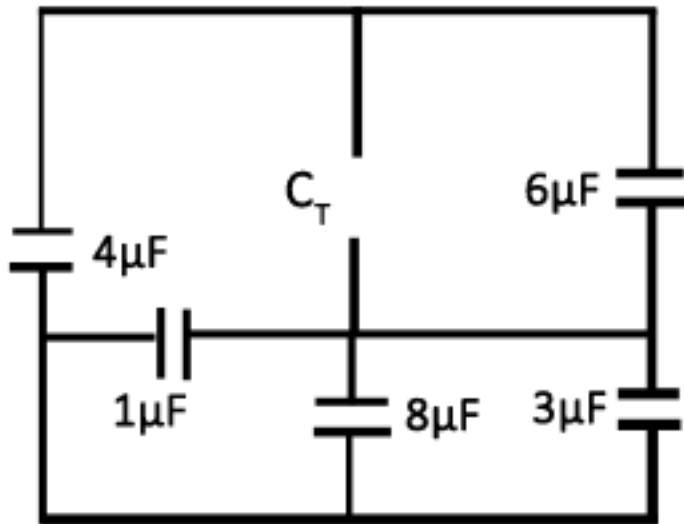
- a) After studying this course, please identify the two broad areas in the study of electronics in the recent technologies. **(2 Marks)**
- b) Copy the table below and fill in the missing gaps. **(8 Marks)**

MULTIPLIER	PREFIX	SYMBOL
10^{18}		
10^{15}		
10^{12}		
10^9		
10^6		
10^3		
10^2		
10		
10^{-1}		
10^{-2}		
10^{-3}		
10^{-6}		
10^{-9}		
10^{-12}		
10^{-15}		
10^{-18}		

- c) Explain briefly any three reasons why we need standard values for electronic components. **(6 Marks)**
- d) State any four types of resistors commonly used in electronics. **(4 Marks)**

Question Two:

- a) Suppose you were an electronics technician, and UICT needed to purchase LAB equipment and among them were resistors, using the color code bands below, determine the value of the following resistors
- Yellow, Green, Blue, Brown and Silver (3 Marks)
 - Blue, Gray, Black and Gold (3 Marks)
- b) John needed to buy a suitable capacitor to complete his motherboard assignment but he was pondering on the factors to be considered to acquire one. Please guide him on what to do as a LAB attendant as you define a **Farad** as a unit of capacitance and stating the formula? (8 Marks)
- c) Find the total capacitance C_T of the network in the figure below. (6 Marks)



Question Three:

A coil of inductance 636.6mH and negligible resistance is connected in series with a 100 Ω resistor to a 250V, 50 Hz supply. Calculate;

- a) The inductive reactance of the coil, (2 Marks)
- b) The impedance of the circuit, (2 Marks)
- c) The current in the circuit, (2 Marks)
- d) The p.d across each component and (2 Marks)
- e) The circuit phase angle. (2 Marks)

Question Four:

- a) Explain how valence electrons determine the electrical properties of a material. (4 Marks)
- b) With the aid of a diagram, briefly describe the different bands in relation to conductors, insulators and semi-conductors. (4 Marks)
- c) With the aid of a diagram, explain the operation of a PN junction when it is forward biased. (6 Marks)
- d) Using suitable drawings, explain how a bridge rectifier operates. (6 Marks)

Question Five:

- Explain the difference between NPN and PNP transistors by illustrations (4 Marks)
- Using a suitable diagram, explain how a PNP transistor operates (8 Marks)
- With the aid of a diagram, briefly describe a Darlington pair. (6 Marks)
- List the basic two applications of transistors. (2 Marks)

(15)

Table 1. Colour codes used on passive electronic components

Colour	Digit	Multiplier: 10 ^{digit}	Resistors: tolerance	Temp.coef. ppm/°C	Inductors: tolerance
Silver	(-2)	*0.01 10 ⁻²	10% (K)	not used	10%
Golden	(-1)	*0.1 10 ⁻¹	5% (J)	not used	5%
Black	0	*1 10 ⁰	not used	not used	20%
Brown	1	*10 10 ¹	1% (F)	100	1% (mil)
Red	2	*100 10 ²	2% (G)	50	2% (mil)
Orange	3	*1 000 10 ³	not used	15	3% (mil)
Yellow	4	*10 000 10 ⁴	not used	25	4% (mil)
Green	5	*100 000 10 ⁵	0.5% (D)	not used	not used
Blue	6	*1 000 000 10 ⁶	0.25% (C)	10	not used
Violet	7	*10 M 10 ⁷	0.1% (B)	5	not used
Gray	8	*100 M 10 ⁸	0.05%	not used	not used
White	9	*1 G 10 ⁹	not used	1	not used
None					20%

Must Remember

*****GOOD LUCK*****