



**COLLEGE OF ENGINEERING, SCIENCE AND TECHNOLOGY  
SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING**

**TRADE DIPLOMA PROGRAMME**

**EEE460 INTRODUCTION TO ELECTRICAL AND ELECTRONIC  
ENGINEERING**

**FINAL EXAMINATION (TRIMESTER 2, 2017)**

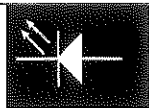
DATE/TIME/ROOM – Refer to Exam Timetable

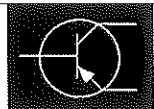
**INSTRUCTIONS TO CANDIDATES**

1. You are allowed 10 minutes extra time during which you are not to write.
2. Write all your answers in the allocated Answer Booklet.
3. Begin each answer on a fresh new page and use both sides of the sheets.
4. Write your identification number on the top of each attached sheet.
5. Insert all written foolscaps, graph paper, drawing paper, etc in their correct sequence and secure with string provided.
6. For all sheets of paper in which has been done, cross it through and you must attach to your answer script.
7. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
8. All Sections are compulsory.

**Section A:****Matching****(20 marks)****Instructions:**

Match the associated numbers with the appropriate alphabets by writing the alphabet on the attached answer sheet in Appendix 1 and attached Appendix 1 to the answer booklet.

Question #		Alphabet item	
1	Illustrate the symbol that represents the L.E.D.	A	4
2	How many diodes are used in a half-wave rectifier circuit?	B	
3	Apply which of the digital Integrated circuit that operates on +5V.	C	Truthtable
4	What is the base of the hexadecimal numbering system?	D	1
5	Specify the table used in the description of operations of any digital gate.	E	AND gate
6	Relate the symbol associated to the PNP transistor.	F	TTL
7	The turns ratio of a transformer that has an $N_S$ of 50 and an $N_P$ of 25 is _____.	G	Set
8	The components used in a power supply filter circuit is/are the _____.	H	Base of 10
9	Determine the component name that is found in the full-wave bridge rectifier stage of the DC Power supply.	I	OR gate
10	Interpret the Logical gate that performs a TRUE output when both or all the inputs to this gate is TRUE.	J	Reactive components
11	Determine the Decimal Numbering System radix.	K	Reset
12	When a latch has its Q output HIGH and its Q' output LOW, what is the latch classified as?	L	2:1
13	Apply which logic gate is used to determine the output as TRUE if any of the inputs is TRUE.	M	CMOS

14	Specify the logic gate used to indicate a TRUE if the lone input is FALSE.	N	Relay
15	Apply the number of diodes that are used in a full-wave rectifier circuit.	O	PN junction Diodes
16	Relate to which device it has a solenoid, an armature, contacts and a core. This device is used to switch high current circuits.	P	NOT or INVERTER gate
17	Determine the application of an unregulated DC Power Supply.	Q	Base of 16
18	When a latch has its Q output LOW and its Q' output HIGH, the latch is considered _____.	R	+5V
19	Determine the output voltage of the 7805 positive voltage regulator.	S	Mobile Phone Charger
20	Specify the type of digital IC that operates on the voltage of 3V to 18V.	T	

**Section B: Multiple Choice (30 marks)**

**Instructions:**

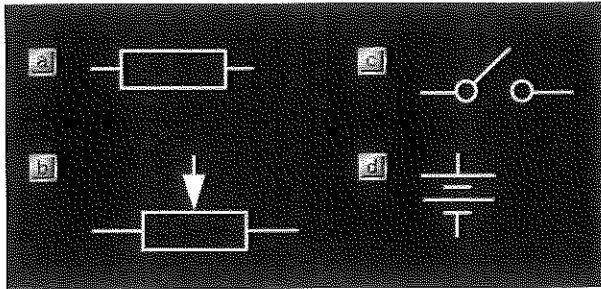
Choose the answer by circling the correct alphabet as per answer sheet (Appendix 2) that is attached to the question. Attach appendix 2 to the answer booklet. (1 mark for each correct answer)

- The ohm is the unit of measure for \_\_\_\_\_.
  - Power
  - Heat
  - Current
  - Resistance
- What is the reference designator for the second resistor on a schematic diagram?
  - R2
  - R1
  - R3
  - R0

3. Which of the following resistor has the most resistance?

- a)  $10\ \Omega$
- b)  $100\ \Omega$
- c)  $5\ \Omega$
- d)  $50\ \Omega$

4. Which symbol represents a variable resistor?



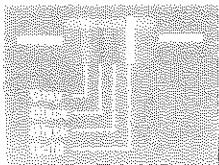
5. How the ohmic value is normally marked on a precision resistor?

- a) Colour bands
- b) Bar code
- c) Number/Letter Code
- d) Not Marked

6. How is resistor tolerance expressed?

- a)  $\pm$  ohms
- b) Range of values
- c) Assumed
- d) Percent

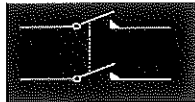
7. What is the ohmic value and tolerance for this resistor?



(Grey, Black, Black, Gold)

- a)  $8\ \Omega$  5%
  - b)  $80\ \Omega$  5%
  - c)  $80\ \Omega$  10%
  - d)  $8\ \Omega$  10%
8. A good conductor is made of\_\_\_\_\_.
- a) Glass
  - b) Paper
  - c) Copper
  - d) Rubber

9. Switches are used to \_\_\_\_\_.
- Open or close current paths.
  - Control the level of resistance.
  - Protect a circuit from current flow.
  - Open the current path in case of overload.
10. Which of the following answers best describes a normally closed switch?
- A switch that cannot be opened.
  - A switch that once closed remains closed until it is unlatched by a voltage.
  - A switch that remains open until manually closed.
  - A switch that remains closed until manually opened.
11. A switch in the open position \_\_\_\_\_.
- Stops current flow.
  - Allows current flow.
  - Increases current flow.
  - Decreases current flow.
12. Which of the following answers best describes this switch?

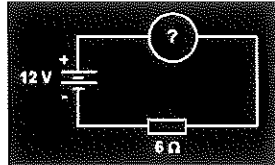


- SPST
  - SPDT
  - DPST
  - DPDT
13. Which quantities can be measured by a Multimeter?
- Voltage, resistance and power
  - Resistance, current and power
  - Current, voltage and power
  - Voltage, current and resistance
14. What is the major difference between analog and digital multimeters?
- The type of function switch
  - The type of range switch
  - The type of display
  - The type of input jacks
15. Digital multimeters vary \_\_\_\_\_.
- As to power requirements
  - In size
  - In shape
  - In all of the ways above.

16. A multimeter is NOT used to measure \_\_\_\_\_.

- a) Resistance
- b) Voltage
- c) Current
- d) Coulombs

17. Solve the current in this circuit.



- a) 0.5 A
- b) 2 A
- c) 5 A
- d) 7.2 A

18. Ohm's Law states that current is \_\_\_\_\_.

- a) Inversely proportional to power.
- b) Directly proportional to voltage
- c) Inversely proportional to voltage
- d) Directly proportional to resistance.

19. How many paths for current are in a series circuit?

- a) 1
- b) 2
- c) 3
- d) 4

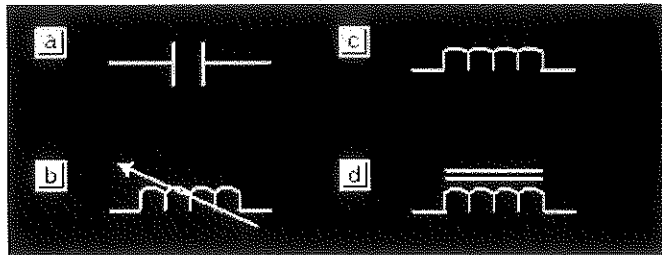
20. Total resistance in a two resistor parallel circuit is equal to:

- a)  $R_1 \times R_2$
- b)  $R_1 + R_2$
- c)  $(R_1 \times R_2)/(R_1 + R_2)$
- d)  $(R_1 + R_2)/(R_1 \times R_2)$

21. Kirchhoff's Voltage Law states:

- a) All voltage sources equal the voltage drops.
- b) In a loop, all voltage sources equal voltage drops.
- c) In a loop, the algebraic sum of the voltage drops and voltage sources equals zero.
- d) The sum of the currents into a point equals the sum of the current out of the point.

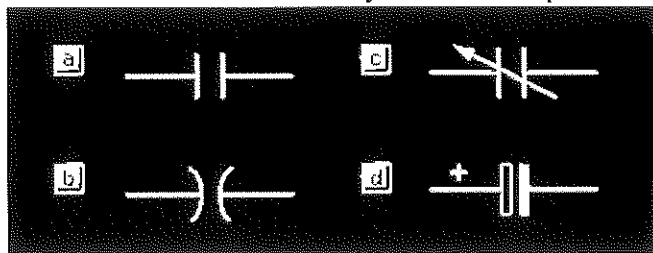
22. Which is the schematic symbol for an iron core inductor?



23. The ability of an inductor to concentrate a magnetic field is called \_\_\_\_\_.

- a) Capacitance
- b) Resistance
- c) Inductance
- d) Impedance

24. Which is NOT a schematic symbol for a capacitor?



25. The ability of a capacitor to store a charge is called \_\_\_\_\_.

- a) Resistance
- b) Inductance
- c) Capacitance
- d) Dielectric Constant

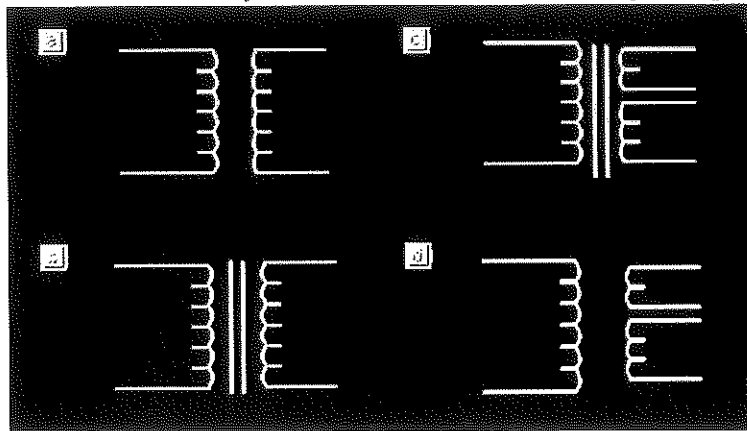
26. What is the unit of measurement for capacitance?

- a) Maxwells
- b) Henries
- c) Farads
- d) Watts

27. In a step-up transformer, \_\_\_\_\_.

- a) The output voltage is greater than the input voltage.
- b) The input voltage is greater than the output voltage.
- c) The output voltage is less than the input voltage.
- d) The output power is greater than the input power.

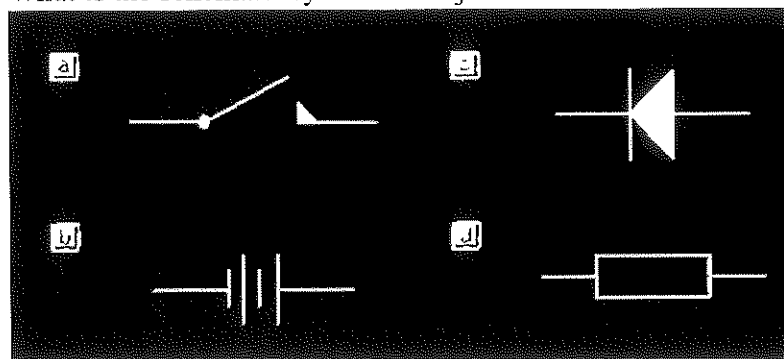
28. Which schematic symbol indicates an air core single output transformer?



29. What is the purpose of a junction diode?

- a) It allows current flow in both directions.
- b) It allows current flow in one direction.
- c) It produces a difference in potential.
- d) It produces free electrons and holes.

30. What is the schematic symbol for a junction diode?





## Section C

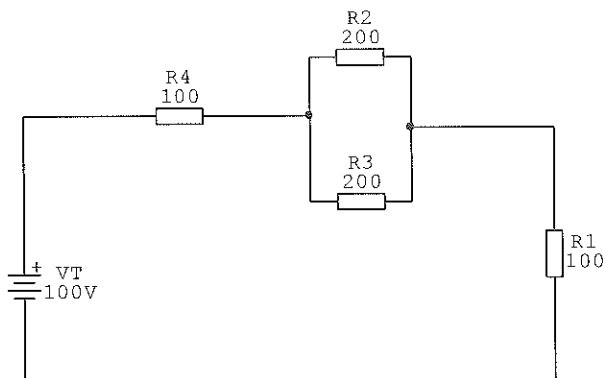
(50 Marks)

### Instructions:

Write your answers on the answer booklet.

Component Identifications, Circuit Operations and Circuit Calculations:

- Determine the colour codes of the colour coded resistances:  
(Use Appendix 3 to assist you)
  - $10 \Omega \pm 5\%$  (2 marks)
  - $270 \text{ k}\Omega \pm 20\%$  (2 marks)
  - $560 \Omega \pm 10\%$  (2 marks)
  - $47 \text{ M}\Omega \pm 1\%$  (2.5 marks)
- Calculate the lower and upper inductance value of the given preferred value of the given inductance;  $100 \text{ mH} \pm 5\%$ . (4.5 marks)
- Decode the letter/figure coding of the following capacitors:
  - 103J (2 marks)
  - 223K (2 marks)
- Sketch the following gates symbol and determine its truthtable
  - Two inputs AND gate (3 marks)
  - Two inputs OR gate (3 marks)
  - Two inputs NAND gate (3 marks)
  - Two inputs NOR gate (3 marks)
  - Two inputs EXOR gate (3 marks)
- Determine the equivalent of the numbering systems:
  - $46_{10} = \underline{\hspace{2cm}}_2$  (2 marks)
  - $111101110_2 = \underline{\hspace{2cm}}_{10}$  (2 marks)
- Given the series/parallel resistive circuit diagram, determine:



((Note all resistances are measured in Ohms))

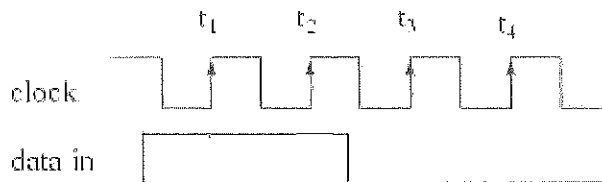
- Equivalent resistance (3 marks)
- Total current (2 marks)

- c)  $V_1$  using Kirchhoff's Voltage Law (2 marks)
- d)  $I_3$  using Kirchhoff's Current Law (2marks)

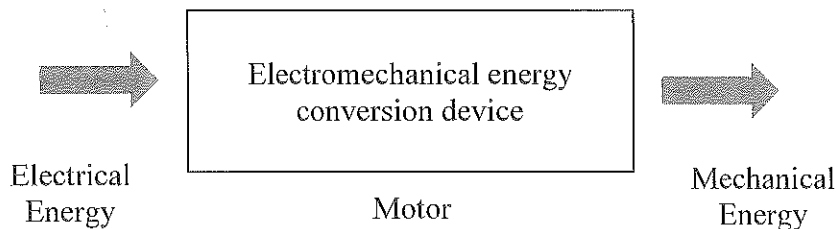
7. Choose only **ONE** of the following by writing the part number clearly on your answer booklet:

(5 marks)

- a) Illustrate the block diagram of an unregulated DC Power Supply Unit and briefly describe in your own words the purpose of each stage.
- b) Sketch the block diagram of a regulated DC Power Supply Unit and briefly describe in your own words the purpose of each stage.
- c) Draw the D-Flipflop symbol and determine the waveform for the Q output

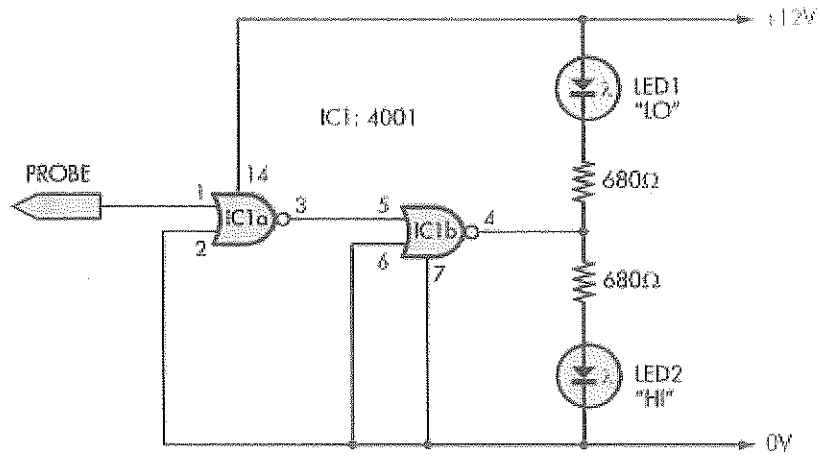


- d) Relate the given block diagram shown below of a DC motor as an example of an actuator and briefly explain the term “actuator”. Sketch the DC motor model and identify its parts.



- e) Draw a circuit diagram showing a step-down transformer, an alternating source and load resistor. Indicate on the circuit diagram showing the number of turns, voltage and current parameters.

- f) Describe in your own words on the circuit diagram of the Logic Probe shown below operates.



-----THE END-----

## Appendix 1

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Student's ID#: \_\_\_\_\_

### Section A

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_
20. \_\_\_\_\_

## Appendix 2

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Student's ID#: \_\_\_\_\_

### Section B

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D

21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D
26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D

## Appendix 3

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### Colour codes

Color	Digit	Multiplier	Tolerance (%)
Black	0	$10^0$ (1)	
Brown	1	$10^1$	1
Red	2	$10^2$	2
Orange	3	$10^3$	
Yellow	4	$10^4$	
Green	5	$10^5$	0.5
Blue	6	$10^6$	0.25
Violet	7	$10^7$	0.1
Grey	8	$10^8$	
White	9	$10^9$	
Gold		$10^{-1}$	5
Silver		$10^{-2}$	10
(none)			20