



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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 2

UNIT CODE: EEE392

TITLE: ELECTRONICS FOR ELECTRICIANS

FINAL EXAMINATION – TRIMESTER 2, 2015

**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 answer 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 string*
- 5. For all sheets of paper on which rough/draft work has been done, cross it though and you MUST ATTACH to your answer scripts.*
- 6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.*
- 7. ANSWER ALL QUESTIONS.*
- 8. Show all workings where necessary.*
- 9. Do not use programmable calculators, especially the ones that does the conversions of number systems.*
- 10. ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!*

SECTION A:**MULTIPLE CHOICE****[30 MARKS]****Instructions:**

Choose the appropriate answer from each question and write it alongside the question number in your answer sheet. Each Multiple Choices is worth 1 mark.

1. What is a varistor?
 - a) a voltage-dependent diode
 - b) a current-dependent resistor
 - c) a current-dependent diode
 - d) a voltage-dependent resistor
2. Name the cable as shown that is used as extension cord:



Figure 1

- a) Twisted stranded cable
 - b) Speaker cable
 - c) Co-axial Cable
 - d) Signal Cable
3. A good NPN transistor should test low resistance (low-voltage drop) between the _____ and _____, and high resistance (over limit voltage drop) between the _____ and _____.
 - a) Base - emitter; emitter – collector
 - b) Emitter - collector; gate – trigger
 - c) Trigger - base; collector – gate
 - d) Collector - base; emitter – base
 4. A capacitor is in series with a light bulb. When connected to an alternating current supply. The bulb glows. Which one of the statements is correct?
 - a) Charge is flowing on and off the plates, resulting in a current, which lights the bulb. The capacitor does NOT conduct electricity.
 - b) The capacitor has started to conduct electricity, so a current flows through the bulb.
 - c) The capacitor has turned the alternating current into direct current, enabling the bulb to glow.
 - d) The capacitor is faulty, so current is passing through it

5. The inductance of an inductor will be affected by which property or properties of the inductor's core?

- a) The material of the core.
- b) The material and size of the core.
- c) The shape and size of the core.
- d) The shape, size and material of the core.

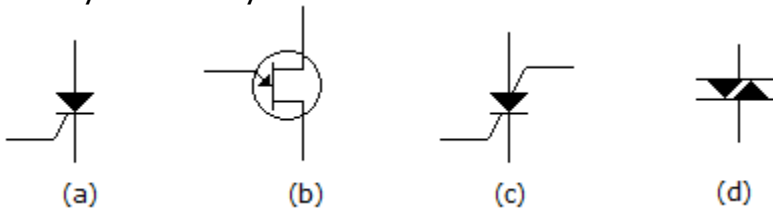
6. The characteristic curve for the complex model of a silicon diode shows that

- a) The barrier potential stays fixed at 0.7 V
- b) The barrier potential is 0 V
- c) The barrier potential increases slightly with an increase in current
- d) The barrier potential decreases slightly with an increase in current

7. What charge is held by a 2.2 microfarad capacitor at a voltage of 6 V?

- a) 2.2 microcoulombs
- b) 13.2 microcoulombs
- c) 6.0 microcoulombs
- d) 0.33 microcoulombs

8. Identify the diac symbol?



- a) a
- b) b
- c) c
- d) d

9. The diagram shows

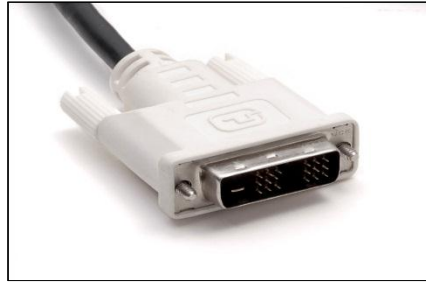


Figure 2

- a) VGA cable
- b) HDMI cable
- c) DVI cable
- d) Sata cable

10. What type of connectors is used at the input of an oscilloscope?

- a) UHF connectors
- b) Co-ax connectors
- c) D.I.N connectors
- d) B.N.C connectors

11. Which one of the following statements is true for an electrolytic capacitor?

- a) It holds less charge than a non-electrolytic capacitor.
- b) It does not conduct electricity if connected with reverse polarity.
- c) It can explode if connected with reverse polarity.
- d) It has a very high breakdown voltage.

12. During the soldering process, at times short circuits are formed. These are created by:

- a) A good joint
- b) Solder bridges
- c) Heating
- d) Dry joints

13. The primary and secondary winding of transformer are linked each other by
- Conduction.
 - Mutual induction.
 - Not linked at all.
 - self induction.

14. Refer to Figure 3. The peak to peak voltage is

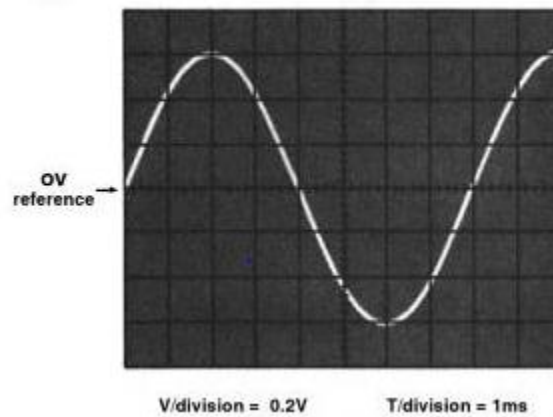


Figure 3

- 6V
 - 3V
 - 1.5V
 - 1.2V
15. Refer to Figure 3. The frequency is waveform is
- 8 Hz
 - 125 Hz
 - 250 Hz
 - 4 Hz
16. When matching polarity connections have been made and the potential difference (PD) is above 0.7 V, the diode is considered to be:
- Forward biased
 - Not working
 - Reverse biased
 - An open switch

17. Which setting will you use to move the waveform for better and easier measurements?
- a) Time/division settings.
 - b) Vertical positioning.
 - c) Voltage/division setting of the designated input.
 - d) Horizontal positioning.
18. Which of the following properties should an ideal op amp have?
- a) Infinitely wide bandwidth, infinitely high output impedance and perfect linearity.
 - b) High DC gain, low input reactance and perfect linearity.
 - c) Infinitely high input impedance, perfect linearity and zero noise.
 - d) Infinitely high gain, perfect linearity and zero input impedance.
19. The output of an NOR gate is HIGH
- a) All the time
 - b) When all inputs are HIGH
 - c) When any input is HIGH
 - d) When all inputs are LOW
20. If a 169.7 V half-wave peak has an average voltage of 54 V, what is the average of two full-wave peaks?
- a) 108.0 V
 - b) 115.7 V
 - c) 119.9 V
 - d) 339.4 V
21. In a power supply diagram, which block indicates a smooth dc output?
- a) Transformer
 - b) Regulator
 - c) Filter
 - d) Rectifier

22. Which two components are commonly used in light dimmers?

- a) SCR and Diac
- b) SCR and Triac
- c) Triac and Diac
- d) MOSFET and Diac

23. Testing a good diode with an ohmmeter should indicate

- a) high resistance when forward biased and low resistance when reverse biased
- b) high resistance when forward or reverse biased
- c) low resistance when forward or reverse biased
- d) high resistance when reverse biased and low resistance when forward biased

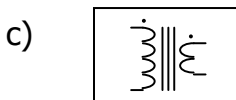
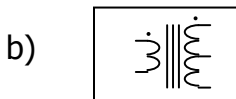
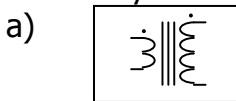
24. If you want to do fine adjustment in the variation of the capacitance, name the appropriate component:

- a) Trimpot.
- b) Trimmer.
- c) Variac.
- d) Potentiometer.

25. Choose the component that contains discrete circuitries?

- a) Transistor.
- b) Capacitor.
- c) Inductor.
- d) Integrated circuit

26. Which symbol is a centre-tapped transformer?



- d) All of the above.

27. Why must an ammeter have an extremely low resistance?

- a) High resistance reduces risk of fire.
- b) High resistance ensures there are fewer ohms.
- c) High resistance changes the voltage reading.
- d) High resistance will change the current in the circuit you want to measure.

28. In order to maintain a constant output voltage, the zener diode

- a) must be connected to a transformer
- b) must remain forward biased
- c) must remain in the breakdown region
- d) must be in series with a filter capacitor

29. Which of the following is the most efficient voltage regulator?

- a) Shunt
- b) Series
- c) Switching
- d) Buck

30. A student connected several loads so that the electrons in the circuit had more than one complete path to follow. She/He had created _____.





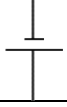

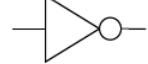

- a) an open circuit
- b) a parallel circuit
- c) a short circuit
- d) a series circuit

SECTION B: [20 MARKS]
MATCHING

[10 MARKS]

Instruction:

Beside each question number in your answer booklet, write the corresponding alphabet to represent your answer:

1	NPN Transistor	A	
2	Oscilloscope	B	Abbreviated as VOM
3	Gate	C	
4	Cell	D	
5	Centre-Tapped Transformer	E	
6	Piezo Transducer	F	
7	PNP Transistor	G	
8	Diode	H	240 Vac to 120 Vac
9	Analogue multimeter	I	
10	Earphone	J	

Component symbols & functions [10 MARKS]

Instructions:

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

<i>COMPONENT</i>	<i>CIRCUIT SYMBOL</i>	<i>FUNCTION IN THE CIRCUIT</i>
a). Earth (Ground)		
b). Triac		
c). Relay		
d). Wire		
e). Transformer		
f). Motor		
g). Bell		
h). Fuse		
i) . SPDT		
j). Capacitor		

SECTION C:
Data sheets & calculations

[25 marks]

Instructions:

Use the attached data sheets to assist you.

1. **Fig - 4a** below shows a circuit diagram of an Op-Amp circuit.
 - i) Name the two input terminals (1 mark)
 - j) Identify the circuit. (1 mark)
 - k) Calculate the **output Voltage (V_o)**. (3 marks)

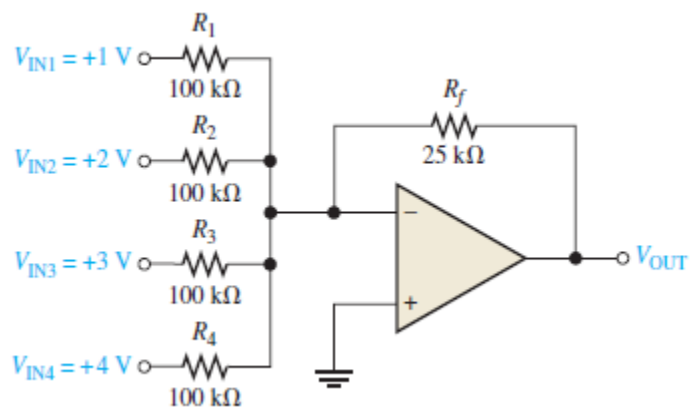


Figure 4

2. A certain zener diode has a $V_z = 7.5\text{ V}$ and an $Z_z = 5\Omega$ at a certain current. Draw the equivalent circuit. (2 marks)
3. Name the four (4) main sections of a basic DC power supply operated from an AC mains power source, stating the function of each section. (4 marks)
4. The Transistors can be used in several applications. Name the 2 applications of Bipolar Junction Transistor (BJT). (2 marks)

5. **Data sheets:**

1) **Data sheets:**

(7 marks)

From the transistor data sheet shown below, determine the:

TYPE	CASE	POL MAT	V _{CE}	V _{CB}	I _{C mA}	V _{CES @I_{C mA}}	H _{fe @ I_{C mA}}	P(TOT) mW	USE	EQUIVALENT
BD140	TO-126	PS	80	100	1.5A	0.5@500	40@250	8W	G.P. o/p	40410
BC559	TO-92 VAR 1	PS	30	30	100	0.65@100	125@800	500	G.P.S.S. amp	BC159
TIP 3055	TOP-3	NS	70	100	15 A	1.1 4A	20 4A	90W	POWER OUTPUT	MJE 3055

- Current gain of BC159 and what current can this transistor operate from? (2 marks)
- Material used in the MJE 3055? (1 mark)
- Abbreviation of G.P. power from the table. (1 mark)
- Power dissipation of BD140? (1 mark)
- Package of MJE 3055? (1 mark)
- Polarity of the BC 559 transistor? (1 mark)

6. Refer to Transformers as important devices in circuits.

- Name the four main parts of a transformer. (2 marks)
- State the three uses of transformers. (3 marks)

SECTION D

[25 Marks]

Sketches, Analysis & Operation

1. What Does TTL stands for?

(1mark)

2. a. With the use of suitable sketches clearly describe the operation of a **Center-Tapped Full-Wave Rectifier circuit.**

(Marks: Cct-2, Waveforms-2, Operation-2)

(6 marks)

b.

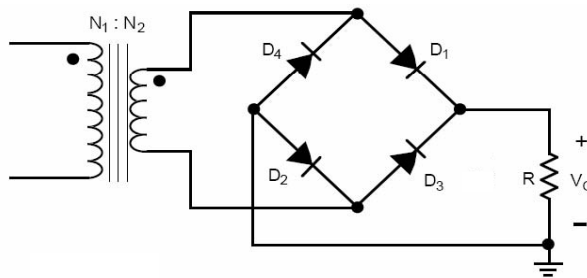


Figure 5: Bridge Full-Wave Rectifier

i. Determine the peak output voltage for the bridge rectifier if the transformer produces an rms secondary voltage of 12V having a load resistance of 10kΩ.

(3 marks)

ii. What is the PIV rating for the diodes?

(1 mark)

3. The Boolean equation for a logic circuit with inputs A and B and output Q is:

$$Q = (A \cdot B) + (A' \cdot B')$$

a. Complete the truth table to show the logic values of the terms below for all the combinations of the inputs A and B.

A	B	A'	B'	A.B	A'.B'	Q
0	0					
0	1					
1	0					
1	1					

(5 marks)

b. Complete the diagram below to show how a logic circuit can be constructed that has the same function as the Boolean equation above using **two** AND gates, **two** NOT gates, and **one** OR gate.

(2 marks)

4. Suppose you have been given **two** new transistors. With the use diode configuration in the transistor, explain the procedure for identifying the transistors using a millimeter?

(7 marks)

THE END