NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE (MAJOR AND MINOR)	
QUALIFICATION CODE: 07BOSC	**LEVEL:** 6
COURSE NAME: ELECTRICAL CIRCUIT AND ELECTRONICS	**COURSE CODE:** ECE602S
SESSION: NOVEMBER 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER (S)	EMMANUEL EJEMBI
MODERATOR:	SAHU DIPTI

PERMISSIBLE MATERIALS

Scientific Calculator

THIS EXAMINATION QUESTION PAPER CONSISTS OF 7 PAGES

(INCLUDING THIS FRONT PAGE)

SECTION A

QUESTION 1 **[30]**

Short Answer Question Types: Each question in this section carries two marks.

1.1 To obtain n-type semiconductor, the impurity added to a pure semiconductor is (2)

a. Trivalent b. Tetravalent c. Pentavalent d. None of these

1.2 An n-type semiconductor has electrons as a majority carriers, due to this material attains negative charge on it. (2)

a. True b. False

1.3 In a P-type semiconductor the majority carriers are (2)

a. Holes b Electrons c Positive ions d. Negative ions

1.4 When a PN junction is forward biased. (2)

a. It offers a low resistance and the large current flows through it.

b. It was a high resistance and small current flows through it.

c. It act as an insulator and no current flows through it.

d. The width of the depletion layer increases.

1.5 The barrier voltage at a pn junction for germanium is about (2)

a. 0.3 V b. 0.7 V c. 0.8 V d. 0.4 V

1.6 In a full wave rectifier, the current in each diode flows for (2)

a. Whole cycle of the input signal
b. Half cycle of the input signal
c. More than half cycle of the input signal
d. None of these.

1.7 Zener diode is operated in (2)

a. Breakdown region b. Forward region c. Both a and b d. None of these

1.8 The most commonly used transistor circuit arrangement is (2)

a. Common base b. Common emitter c. Common collector d. None of these

1.9 Emitter of transistor is doped (2)

a. Heavily b. Lightly c. Moderately b. None of these

1.10 The arrowhead on the transistor symbol points in the direction of (2)

a. Electron flow in the emitter region

b. Minority carriers flow in the emitter region

c. Majority carriers flow in the emitter region

d. Conventional current flow in the emitter region

1.11 The Quiescent point Q in a voltage amplifier is selected in the middle of the active (2)

region because

a. It gives better stability
b. The circuit needs a small DC voltage
c. The baising circuit needs less number of resistors
d. It gives a distortion less output

1.12 The base of a transistor is _____doped. (2)

a. Heavily

b. moderately

c. Lightly

d. None of the above

1.13 In an npn transistor, _____ are the minority carriers. (2)

a. Holes b. Free electrons c. Donors ions d. Acceptor ions

1.14 At the base –emitter junctions of a transistor, one find (2)

a. A reverse bias b. A wide depletion layer c. Low resistance d. None of the above

1.15 An amplifier has Ai = 40 and Av = 30. What is the power gain by the transistor?

a. 120 b. 12000 c. 1200 d. 1300

SECTION B

QUESTION 2 **[15]**

2.1 State Kirchhoff's Voltage Law. (2)

2.2 Write down Kirchhoff's voltage law equation from **Figure 2.1**. (3)

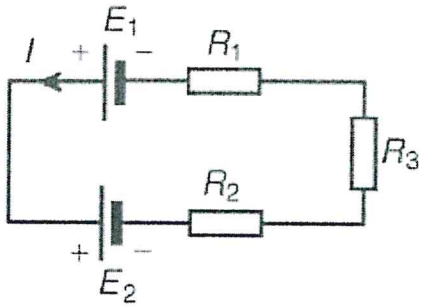

Figure 2.1

2.3 Use Kirchhoff's laws to determine the currents flowing in each branch of the network shown in **Figure 2.2.** (10)

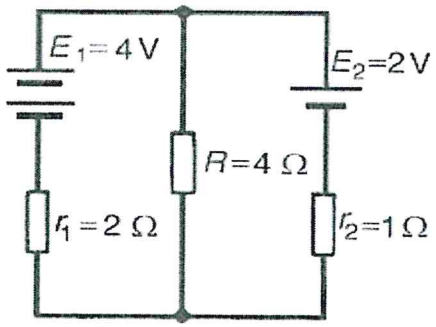

Figure 2.2

QUESTION 3 **[15]**

3.1 State Norton's theorem. (2)

3.2 List the procedure adopted when using Norton's theorem to find current in an electric circuit. (4)

3.3 Use Norton's theorem to determine the current I flowing in the 4 Ω resistance shown in **Figure 3.1**. (6)

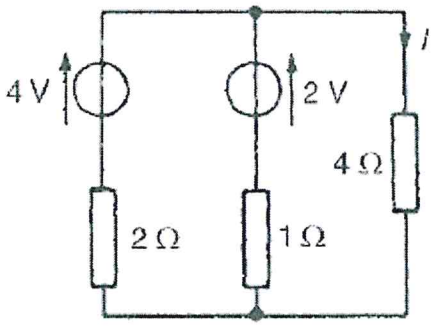

Figure 3.1

3.4 Use the calculated current in **question 3.1** and find also the power dissipated in the 4 Ω resistance, shown in **Figure 3.1** above. (3)

QUESTION 4 **[15]**

4.1 What did you understand by doping in semi-conductor? (2)

4.2 List three pure semi-conductor elements. (3)

4.3 Briefly explain the majority and minority carriers, associated with a p-n junction semi conductor. (5)

4.4 Sketch the forward characteristics of a germanium and silicon p-n junction diode and describe the shapes of the characteristics. (5)

QUESTION 5 **[15]**

5.1 What did you understand by the term rectifier? (2)

5.2 List three types of rectifier circuits. (3)

5.3 Draw a half-wave rectifier circuit and explain what happened to the diode during positive and negative cycle of the input. (5)

5.4 What is the value of V_{dc} and V_{ac} developed across the load in the circuit shown in **Figure 5.1** assuming all diodes to be ideal. What is the frequency of ac voltage present across the load? (5)

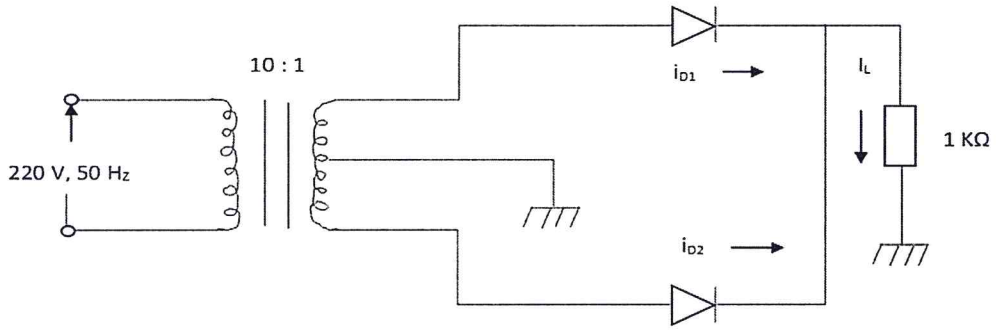

Figure 5.4

QUESTION 6 **[10]**

6.1 Briefly explain the following region of operation of a bipolar junction transistor (BJT) (2)

i. Cut-off region.
ii. Saturation region.

6.2 Draw a p-n-p and n-p-n transistor symbol showing the direction of conventional current. (2)

6.3 A collector power supply voltage of 12 V, was biased to a common-emitter amplifier circuit, a steady base current I_B of 0.1 mA enter the transistor through the base terminal and generate a static current gain $\propto_e$ of 50, as shown in **Figure 6.1**. (6)

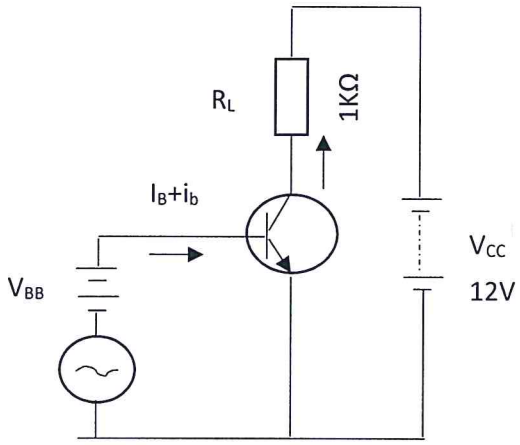

Figure 6.1

Calculate

i. The collector current I_C.
ii. The voltage drop V_d across the load resistor.
iii. The voltage at the collector-emitter V_{CE}.