

POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

ELECTRICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION
JUNE 2012 SESSION

EE201 : SEMICONDUCTOR DEVICES

DATE : 20 NOVEMBER 2012 (TUESDAY)
DURATION : 2 HOURS (8:30 AM TO 10.30 AM)

This paper consists of **TEN (10)** pages including the front page.

Section A1 : **Objective (10 Question)**

Section A2 : **Fill in the blank (10 Question)**

Section B : **Structured (10 Question)**

Section C : **Essay (2 Question)**

Answer all questions

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DO NOT OPEN THIS QUESTION PAPER UNTIL INSTRUCTED
BY THE CHIEF INVIGILATOR

(The CLO stated is for reference only.)



OBJECTIVE

Instructions: This section consists of 20 objective questions. Answer all questions in the answers booklet.

1. Which of the following statements explain the term a semiconductor? [CLO1]

- A. Valence electron are weakly attracted to the nucleus of the atoms
- B. Material that behaves in between a conductor and insulator.
- C. The substance that resist the flow of electric current.
- D. High amount of free mobility electrons.

2. Which of the following statements is NOT the diode application in an electronic circuit ?. [CLO1]

- A. Diode as Clipper.
- B. Diode as Rectifier.
- C. Diode as Amplifier.
- D. Diode as Clamper

3. A full-wave bridge rectifier consists of [CLO2]

- A. 1 Diode
- B. 2 Diodes
- C. 3 Diodes
- D. 4 Diodes

4. RC coupling configuration is a part of multistage amplifier, when

the output of the first stage is

[CLO1]

- A. Coupled to the input of the next stage through the capacitor and resistive
- B. Coupled to the input of the next stage through an impedance matching transformer
- C. Directly connected to input of the next stage
- D. Coupled to the input of the next stage through the inductor

5. Which of the statement below describe the operation of direct coupling circuit?

[CLO1]

- i. There is a direct connection between the collector of the first transistor and the base of the second transistor
 - ii. The coupling capacitor transmits the amplified ac voltage to the next stage
 - iii. The ac voltage is coupled through a transformer to the next stage.
- A. i
 - B. i and ii
 - C. ii and iii
 - D. i, ii, and iii

6. The transistor operating in cut off and saturation region acts like

[CLO 1]

- A. Switch
- B. Linear amplifier
- C. Variable resistor
- D. Variable capacitor

7. Given $I_B = 125\mu\text{A}$ and $\beta = 200$, the collector current will be [CLO 2]

- A. $25\mu\text{A}$
- B. 25mA
- C. $0.0025\mu\text{A}$
- D. 0.025mA

8. N-Channel FETs are superior to P-Channel FETs because [CLO1]

- A. They have higher input impedance
- B. They have high switching time
- C. They consume less power
- D. Mobility of electrons is greater than that of holes

9. The supply voltage that is connected directly or indirectly to the drain of a FET is presented by [CLO1]

- A. V_{GS}
- B. V_{DS}
- C. V_{SS}
- D. V_{DD}

10. Below are the **THREE (3)** applications for Unijunction Transistor (UJT) **EXCEPT**..... [CLO1]

- A. timer circuit
- B. phase control
- C. voltage regulator
- D. signal generator circuit

11. The minority carriers in P-type silicon are called _____. [CLO2]
12. Testing a good diode with an ohmmeter should indicate _____ resistance when reverse biased and _____ resistance when forward biased. [CLO1]
13. When the polarity of the battery is such that electrons are allowed to flow through the diode, the diode is said to be _____. [CLO1]
14. Cascaded Amplifier is a _____ connection of two or more amplifiers. The basic purpose of a Cascaded Amplifier is to _____ the voltage gain. [CLO1]
15. The most commonly used coupling in an amplifier is _____. [CLO1]
16. Common Collector configuration shows that _____ terminal will be connected to ground. [CLO 1]
17. Beside used as an amplifier, BJT also used as a _____. [CLO 1]
18. An E-MOSFET works only with _____ gate voltages. [CLO 2]

19. Refer to Figure 1 below. The I-V curve belongs to _____ [CLO 1]

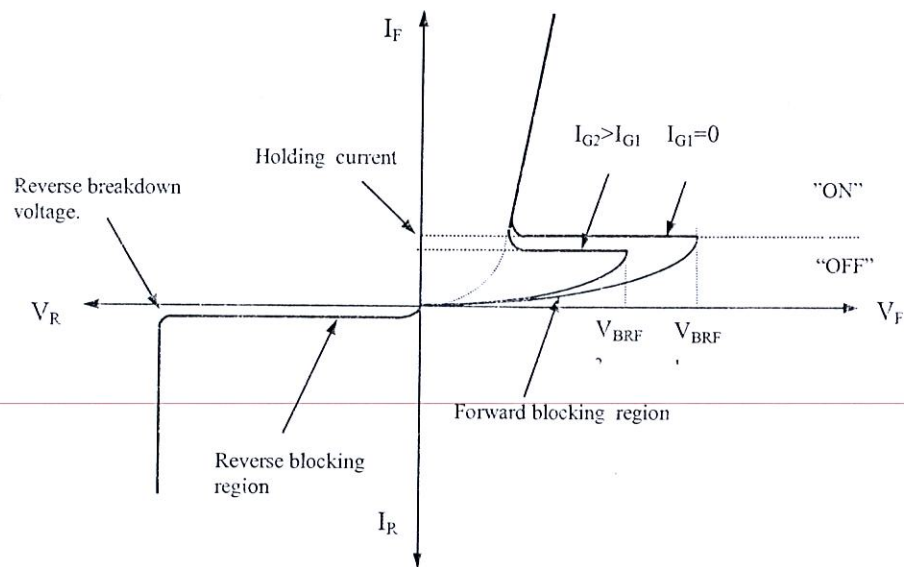


Figure 1

20. In an SCR, the function of the gate is to _____. [CLO2]

SECTION B**STRUCTURED (30 marks)**

Instruction: This section consists of 10 structured questions. Answer **ALL** questions

QUESTION 1

Give **THREE (3)** factors which enable electron to be free from the covalent bond.

[CLO2]

(3 marks)

QUESTION 2

Draw the symbol of LED and give the example of its application.

[CLO2]

(3 marks)

QUESTION 3

If p-type material is connected to the negative terminal of the power supply, what will happen to:-

[CLO2]

- i. Depletion region (1 mark)
- ii. Resistance (1 mark)
- iii. Current flow (1 mark)

QUESTION 4

Draw and label the block diagram of Multistage Amplifier.

[CLO 1]

(3 marks)

QUESTION 5

State the differences between negative and positive feedback in an amplifier. [CLO 1]

(3 marks)

Draw the schematic diagram of a diode clipper and clamper circuits. [CLO1]

(3 marks)

QUESTION 7

Give THREE disadvantages of MOSFET. [CLO1]

(3 marks)

QUESTION 8

Draw and label the symbol of MOSFET below: [CLO2]

(3 marks)

- a. N-channel enhancement MOSFET
- b. N-channel depletion MOSFET

QUESTION 9

Draw and label the schematic symbols for DIAC. [CLO 2]

(3 marks)

QUESTION 10

Name the terminal numbered 1,2,3 for Unijunction Transistor (UJT) below.

[CLO 2]
(3 marks)

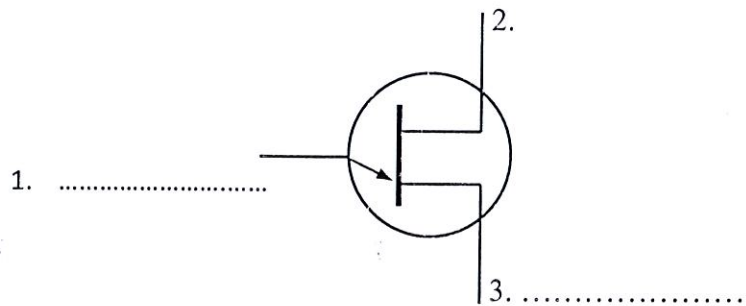


Figure 2

SECTION C**ESSAY (50 marks)****INSTRUCTION:**

This section consists of **TWO (2)** essays questions.

Answer all the questions.

QUESTION 1

Based on the Figure 3, answer the following questions.

Value given for $V_{GH} = 20V_{p-p}$, 50Hz

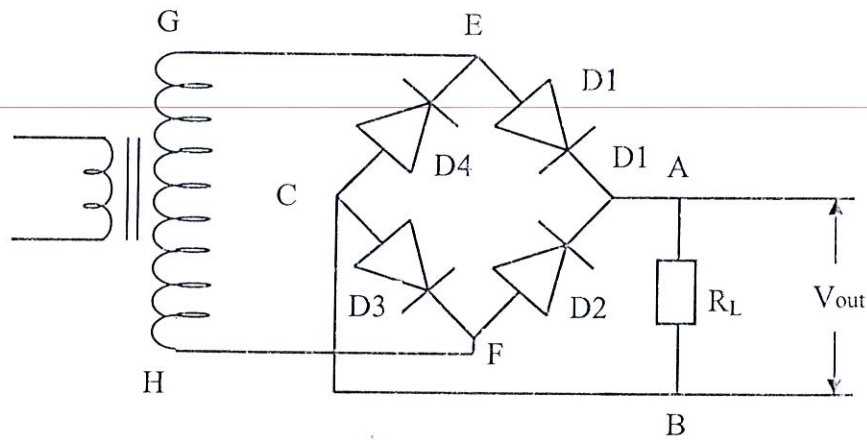


Figure 3

- Draw the wave form at point G-H. [CLO2]
(4 marks)
- Draw the wave form at point A-B. [CLO 2]
(4 marks)
- Determine the value of V_{out} . [CLO 2]
(5 marks)
- Explain how the diodes in circuit diagram operate. [CLO 2]
(12 marks)

QUESTION 2

- a. State the TWO (2) configurations of BJT and draw the connections.

[CLO 2]

(3 marks)

- b.

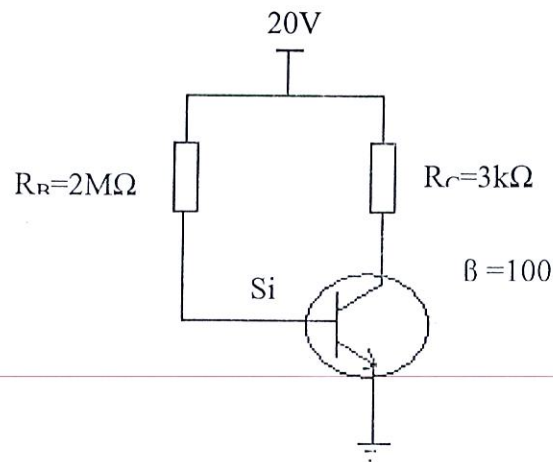


Figure 4

With reference to Figure 4, calculate the value of

[CLO 2]

- i) I_B (3 Marks)
 - ii) I_{CQ} (3 Marks)
 - iii) V_{RC} (3Marks)
 - iv) V_{CQ} (3 Marks)
 - v) Saturation Point (3 Marks)
 - vi) Cut-off point (3 Marks)
- c. Draw the DC Load Line for Figure 4. [CLO 2]

(4 Marks)