

ALUPE UNIVERSITY
COLLEGE
... Bastion of Knowledge...

P. O. Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia- Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2019 /2020 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

MAIN EXAMINATION

COURSE CODE: COM 313

COURSE TITLE: ELECTRONICS II

DATE: 4TH DECEMBER, 2019 **TIME: 2.00 PM – 5.00 PM**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF PRINTED PAGES

PLEASE TURN OVER

COM 313: ELECTRONICS II

STREAM: BSc (Computer Science)

DURATION: 3 Hours

INSTRUCTIONS TO CANDIDATES

- i. Answer **ALL** questions from section A and any **THREE** from section B.
- ii. Maps and diagrams should be used whenever they serve to illustrate the answer.
- iii. Do not write on the question paper.

SECTION A (24 MARKS) COMPULSORY

QUESTION ONE [12 MARKS]

- a. Outline the two main functions of a transistor with respect to its ability to change between different states. (2 Marks)
- b. Diagrammatically contrast between the two types of transistor construction with respect to the two-diode analogy clearly labelling the respective terminals and current directions. (2 Marks)
- c. State two applications where the common base circuit is generally used. (2 Marks)
- d. The bipolar junction transistor has three possible ways of being connected in a circuit arrangement. Briefly describe the three different connection configurations with respect to their current and voltage gains. (6 Marks)

QUESTION TWO [12 MARKS]

- a. What is the function of the DC Load line on the output characteristic curve? (2 Marks)
- b. An NPN Transistor has a DC current gain, (Beta) value of 200. Calculate the base current I_b required to switch a resistive load of 4mA. (2 Marks)

- c. An NPN Transistor has a DC base bias voltage, V_b of 10v and an input base resistor, R_b of $100k\Omega$. What will be the value of the base current into the transistor? (2 Marks)
- d. Describe the three modes which transistors operates in with respect to collector-emitter resistance. (6 Marks)

SECTION B [36 MARKS]

QUESTION THREE [12 MARKS]

- a. Explain how a bipolar junction transistor can be protected from back EMF and high current when included in a circuit as a switching mechanism. (4 Marks)
- b. Design the output characteristic curve of the common emitter configuration which relates the output collector current, (I_c) to the collector voltage, (V_{ce}) when different values of Base current, (I_b) ranging from 0 to $120\mu A$ are applied to the transistor for transistors with the same β value. In the characteristic curve, clearly illustrate the operation regions, DC Load line and Q-point. (8 Marks)

QUESTION FOUR [12 MARKS]

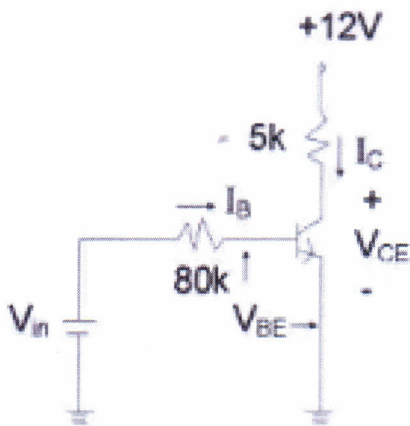
- a. Contrast between BJT and FET transistors with respect to their construction. (2 Marks)
- b. Describe the cause of depletion layer formation in a Field Effect Transistor. (2 Marks)
- c. With the aid of a bias arrangement diagram and its corresponding circuit symbols describe the operation for an N-channel JFET. (8 Marks)

QUESTION FIVE [12 MARKS]

- a. A lamp which is rated at 6v, 24 watts is fully "ON". It is controlled by a standard MOSFET which has a channel "ON-resistance" ($R_{DS(on)}$) value of 0.1ohms. Calculate the power dissipated in the MOSFET switch. (3 Marks)
- b. Explain the main reason why switch mode power supply is preferred over the linear power supplies. (3 Marks)
- c. With the aid of a diagram, explain the principle of operation of a dc amplifier. (6 Marks)

QUESTION SIX [12 MARKS]

- a. Consider the circuit below.



A transistor has the following values: $\beta = 200$, $I_c = 4\text{mA}$ and $I_b = 20\mu\text{A}$.

- i. Find the value of the Base resistor (R_b) required to switch the load "ON" when the input terminal voltage exceeds 2.5v. (2 Marks)
- ii. Find the minimum Base current required to turn the transistor fully "ON" (Saturated) for a load that requires 200mA of current. (2 Marks)

- b. Explain the reason behind making the transistor in the first stage an NPN transistor, while the transistor in the next stage is a PNP transistor in dc coupled amplifiers. (2 Marks)
- c. Explain how a linear mode power supply converts power which makes it different from switched mode power supply (2 Marks)
- d. Outline the causes of offset voltage in chopper stabilized amplifiers. (4 Marks)

QUESTION SEVEN [12 MARKS]

- a. List two applications of a dc coupled amplifier. (2 Marks)
- b. Explain why class A amplifier has a high power loss. (2 Marks)
- c. Explain how the efficiency of class A amplifier can be improved. (2 Marks)
- d. With the aid of a diagram, describe the operation of Class A amplifier. (6 Marks)