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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
KCS 2203 – ANALOGUE ELECTRONICS

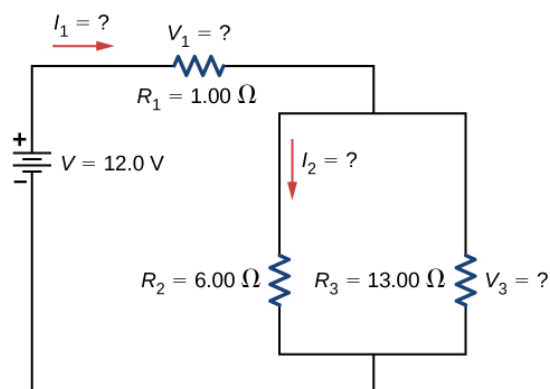
Date: 15TH April 2024
Time: 11:30AM – 1:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

- a) State two differences between analogue and digital signal. (2 Marks)
- b) Explain why digital signal is more effective than analogue signals in transmission of electronic data (2 Marks)
- c) Define the following electrical quantities used in electricity and state their SI units. (6 Marks)
- Electric voltage
 - Electric Current
 - Resistance
- d) Doping is the process of adding impurities to a pure semi-conductor. Apart from adding impurities, how can you improve the conductivity of an intrinsic semi-conductor. (2 Marks)
- e) Explain the effect of adding pentavalent and trivalent impurity to a pure semiconductor material (2 Marks)
- f) Three Resistors $R_1 = 1.00\Omega$ is connected in series with $R_2 = 6.00\Omega$ and $R_3 = 13.00\Omega$ which are connected in parallel in a circuit with a 12.00V voltage source.



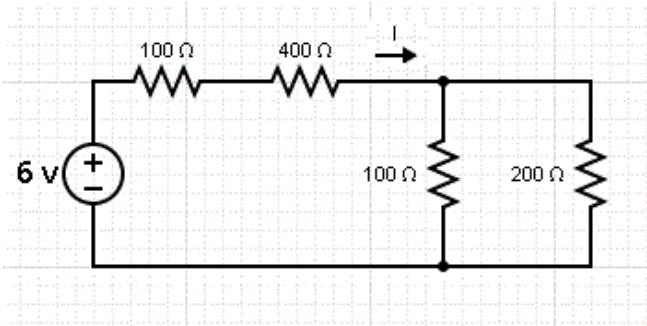
- Find the equivalent resistance (4 Marks)
 - Compute the total current in the circuit. (2 Marks)
 - Find the current across each resistor. (4 Marks)
- g) What is a PN Junction? Explain how a depletion layer is formed between two PN junction when the junction is subjected to some voltage source. (2 Marks)
- h) State two applications of each of the following types of diodes
- Zener diode (2 Marks)
 - Photodiode (2 Marks)

QUESTION TWO (20 MARKS)

- a) Explain the working of Tunnel diode with help of energy band diagrams and Draw voltage - current characteristics. (8 Marks)
- b) Explain the differences between p-type and n-type semiconductor materials. (8 Marks)
- c) Define transistor and explain why an ordinary junction transistor is called bipolar? (4 Marks)

QUESTIONS THREE (20 MARKS)

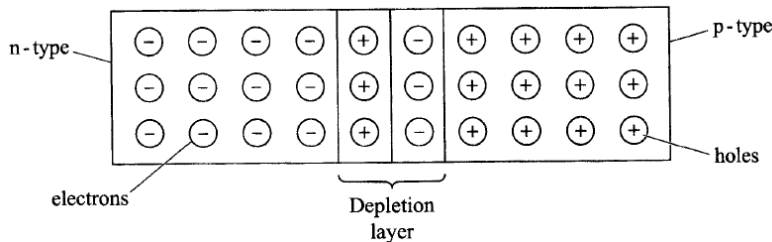
- a) In the circuit below, find the current I and the voltage across 200Ω resistors. (8 Marks)



- b) P- type and N-type semiconductors are made from a pure semiconductor by a process known as “doping”.
- i) Define doping (2 Marks)
- ii) Explain how doping produces an n-type semiconductor. (4 Marks)
- c) Briefly explain the three operating regions of a Bipolar Junction Transistor (BJT). (6 Marks)

QUESTION FOUR (20 MARKS)

- a) With the help of neat diagram and characteristic curves explain the construction & operation of a JFET and mark the regions of operation on the characteristics. (10 Marks)
- b) The figure below shows a depletion layer in an unbiased p-n junction.



- State how a battery can be used to make the depletion layer narrower. (4 Marks)
- c) Discuss the two types of Metal Oxide Semiconductor Field Effect Transistor (MOSFET). (6 Marks)

QUESTION FIVE (20 MARKS)

- a) Using a suitable diagram(s), explain transistor biasing, reverse biasing and forward biasing. (8 Marks)
- b) Draw the circuit diagram of a transistor in CE configuration and explain the output characteristics with the help of different regions. (8 Marks)
- c) Explain the following operation modes in Bipolar Junction Transistor (BJT)
- i) Cut-off mode
- ii) Saturation mode (4 Marks)