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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION, 2022/2023 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(COMPUTER SCIENCE)

Date: 20th April, 2022
Time: 8.30am –10.30am

KCS 203 - ELECTRONICS

INSTRUCTIONS TO CANDIDATES

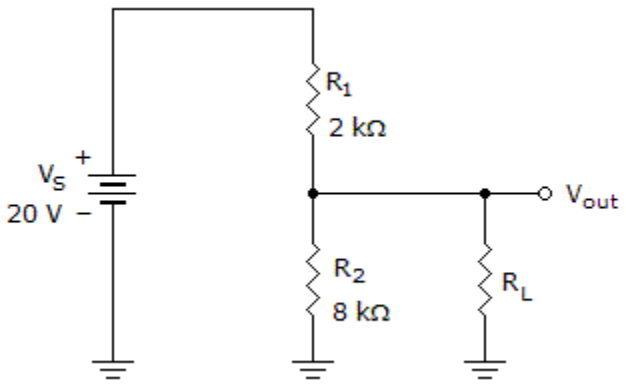
ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER TWO** QUESTIONS

QUESTION ONE (30 MARKS)

a) State ohm's law. (2 marks)

b) Briefly describe the following terms giving the units of measurement used in each of them.
   i) Electric Charge
   ii) Voltage
   iii) Resistance (6 marks)

c)



If the load (R_L) in the given circuit is 120 kΩ, calculate the loaded output voltage? (6 marks)

d) With 21 V applied, if R_1 = 5 ohms, R2 = 35 ohms, and R_3 = 14 ohms, what is the current of R_2 if R_1 is series connected with parallel circuit R_2 and R_3? (6 marks)

e) Explain why an ordinary junction transistor is called bipolar?

(2 marks)

f) Calculate the total resistance of a circuit when R1 (7 k Ω) is in series with a parallel combination of R2 (20 kΩ), R3 (36 kΩ), and R4 (45 kΩ)?

(4 marks)

g) Discuss the input and output characteristics of a CE Junction Transistor?

(4 marks)

QUESTION TWO (20 MARKS)

a) Define the following;

i) fermi level
ii) hole in a semiconductor
iii) doping
iv) p-n junction (8 marks)

b) Differentiate between valence band and conduction band

(4 marks)

c) Explain the effect of temperature on extrinsic semiconductor

(4 marks)

d) Explain the term doping and its need

(4 marks)

QUESTIONS THREE (20 MARKS)

a) Define zener diode?

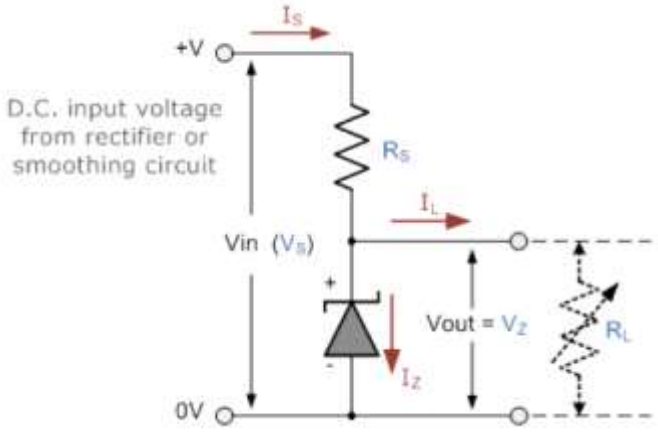
(2 marks)

b) Mention three application of zener diode

(3 marks)

c) Briefly explain why zener diode is used as a voltage regulator

(4 marks)



A 5.0V stabilized power supply is required to be produced from a 12V DC power supply input source. The maximum power rating P_Z of the zener diode is 2W. Using the zener regulator circuit above calculate.

i) The maximum current flowing through the zener diode.
(3 marks)

ii) The minimum value of the series resistor, RS
(4 marks)

iii) The load current I_L if a load resistor of 1kΩ is connected across the zener diode.
(3 marks)

iv) The zener current I_Z at full load.
(2 marks)

QUESTION FOUR (20 MARKS)

a) State three application of a tunnel diode
(3 marks)

b) Discuss the need for biasing a transistor
(4 marks)

c) A transistor has a β_{DC} of 250 and a base current, I_B, of 20 μ A. Calculate the collector current, I_C
(4 marks)

d) Explain how BJT can be used as an amplifier.
(5 marks)

e) Determine the source-to-drain voltage required to bias a p-channel depletion-mode MOSFET in the saturation region.
Consider a depletion-mode p-channel MOSFET for which $\boldsymbol{K_p}$ = **0.2mA/V^2,** $\boldsymbol{V_{TP}}$ **= +0.50 V and** $\boldsymbol{i_D = 0.50\ mA}$**.**
(4 marks)

QUESTION FIVE (20 MARKS)

a) With the aid of a well labeled diagram, explain the following Bipolar transistor configurations.

i) Common Base Configuration (4 marks)

ii) Common Emitter Configuration (4 marks)

iii) Common Collector configuration (4 marks)

b) Briefly discuss the three regions of Operation in MOSFET
(6 marks)

c) Give two disadvantages of using Metal Oxide Semiconductor Field Effect Transistor (MOSFET)
(2 marks)