



MERU UNIVERSITY COLLEGE OF SCIENCE & TECHNOLOGY

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University Examinations 2011/2012

FIRST YEAR, SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF
BACHELOR OF COMPUTER SCIENCE AND FIRST YEAR, SECOND YEAR FOR
THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY.

ICS 2200: ELECTRONICS

DATE: DECEMBER 2011

TIME: 2 HOURS

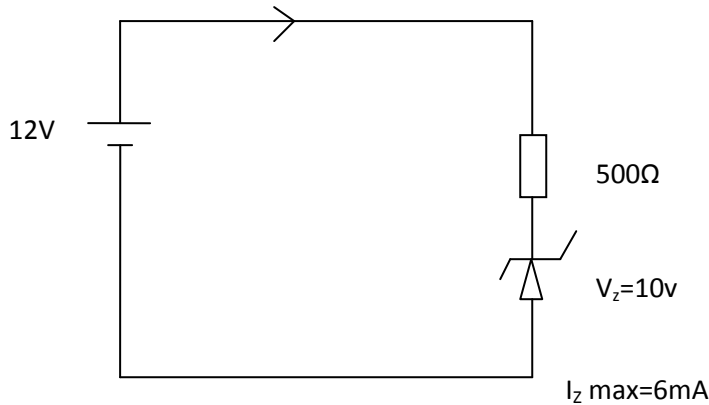
INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE (30 MARKS)

- What is a zener diode? (4 Marks)
- Differentiate between:
 - Donor and Acceptor Impurities (4 Marks)
 - Valence and Conduction Band (4 Marks)
- State the factors that should be put into consideration when biasing a transistor (3 Marks)
- Show that the gain of an inverting amplifier is given by $A_v = \frac{R_f}{R_1}$ where R_f is the feedback resistance (4 Marks)
- A C-B connected transistor has $\alpha=0.96$ and $I_E=2$ mA. Find I_C and I_B (5 Marks)
- Plot a graph of I_D against V_{GS} for a constant value of V_{DS} and hence state the equation of I_D (4 Marks)
- What is forbidden gap? (2 Marks)

QUESTION TWO (20 MARKS)

- Define the following terms:
 - Depletion layer (2 Marks)
 - Load line (2 Marks)
- Differentiate between ionic and covalent bonding (6 Marks)
- Why does a pure semiconductor behave like an insulator at absolute zero temperature (5 Marks)
- State and explain whether the zener- diode below is properly biased (5 Marks)



QUESTION THREE (20 MARKS)

- a. State two types of field effect transistors. (2 marks)
- b. Differentiate between:
 - i. Gate and drain terminals (2 Marks)
 - ii. Drain and transfer characteristics (4 marks)
- c. For a N-channel JFET, $I_{DSS} = 8.7 \text{ mA}$, $V_P = -3\text{V}$, $V_{GS} = -1\text{V}$. Find the value of :
 - i. I_D (3 Marks)
 - ii. g_{m0} (3 Marks)
 - iii. g_m (3 Marks)
- d. Draw a basic symbol of a n-type JFET stating the gate , source and drain terminals (3 Marks)

QUESTIONS FOUR (20 MARKS)

- a. Define the following terms:
 - i. Base transport factor (2 Marks)
 - ii. Current gain (2 Marks)
- b. Prove that $\frac{\alpha}{1-\alpha} = \beta$ where β is the current gain of a BJT (8 marks)
- c. A C-E connected transistor has $\beta = 100$ and $I_B = 50\mu\text{A}$ Find α_1 , I_c and I_E (5 Marks)
- a. What is load line of a diode? (3 Marks)

QUESTION FIVE (20 MARKS)

- a. Define the following terms:
 - i. Slew rate (2 marks)
 - ii. Output Impedance (2 Marks)

- b. Design a circuit showing how an OP-AMP can be used as:
- i. Non Inverting Amplifier (4 Marks)
 - ii. Summer (4 Marks)
- c. With the aid of a diagram differentiate between a forward and reverse biased diode (8 Marks)