



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

MECHANICAL AND AUTOMOTIVE ENGINEERING DEPARTMENT

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MECHANICAL AND AUTOMOTIVE ENGINEERING

DPL/DAE

EEE 2250 ELECTRONICS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2HOURS

DATE: SEPTEMBER 2018

Instructions to Candidates

You should have the following for this examination

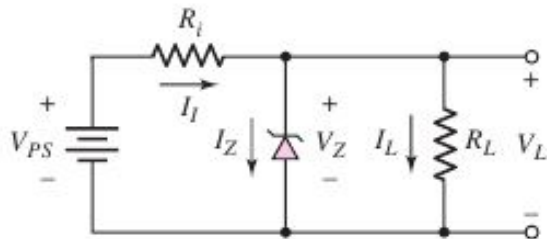
-Answer Booklet, examination pass and student ID

This paper consists of 5 questions. Attempt ANY 3.

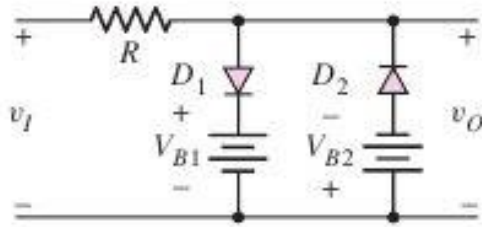
Do not write on the question paper.

Question ONE

- a) What are meant by the terms “Majority Carriers” and “Minority Carriers.” (4 Marks)
- b) The Zener diode regulator circuit shown in Figure below has an input voltage that varies between 10 and 14 V, and a load resistance that varies between $R_L = 20$ and 100Ω . Assume a 5.6 V Zener diode is used, and assume $I_{Z(\min)} = 0.1I_{Z(\max)}$. Find the value of R_i required and the minimum power rating of the diode. (10 Marks)



- c) Sketch the output waveform of the circuit below. Input signal is a sine wave v_I of $\pm 5V$ peak. (6 Marks)

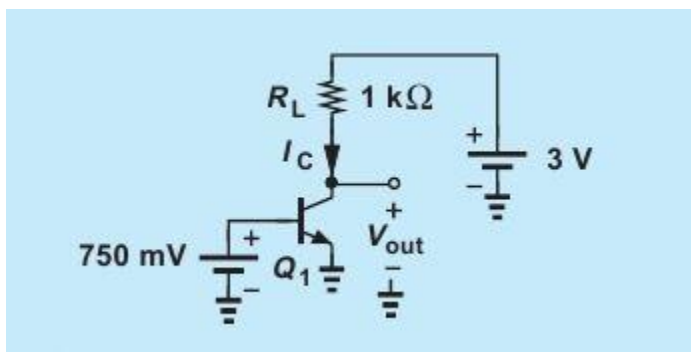


Question TWO

- a) Define the following terms: (4 Marks)
- Valence Band
 - Conduction Band
 - Depletion Region
 - Holes
- b) Using Diagram Describe Half Wave Rectification. (6 Marks)
- c) Using the diode equation, calculate the change in voltage across a junction diode which results from a reduction in forward current to 0.5 of its initial level. Assume a temperature of 290 K. (8 Marks)
- d) Calculate the dynamic slope resistance at 290K of a junction diode operating at a forward current of 10mA. (2 Marks)

Question THREE

- a) Sketch a simple common-emitter amplifier circuit and discuss the general ac circuit characteristics (voltage gain, current gain, input and output resistances). (6 Marks)
- b) Determine the output voltage in Figure below if $I_S = 5 \times 10^{-16} A$. (8 Marks)



- c) Draw Input Characteristics of NPN Transistor in Common Collector Configuration. (4 Marks)

Question FOUR

- a) What is an oscillator? (2 Marks)
b) Draw and label a block diagram of an oscillator. (4 Marks)
c) What are the functions of the basic parts of an oscillator? (6 Marks)
d) Describe Briefly with the aid of block diagrams the feedback and Relaxation oscillators. (8 Marks)

Question FIVE

- a) Describe the ideal op-amp model and describe the implications of this ideal model in terms of input currents and voltages. (6 Marks)
b) Derive an expression for the output V_o of the circuit below in terms of the input voltages V_1 and V_2 and hence determine the output voltage if $V_1 = 1V$ and $V_2 = 0.5V$. (14 Marks)

