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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2019/2020 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
BACHELOR OF SCIENCE IN COMPUTER SCIENCE

KCS 203 - ELECTRONICS

Date: 8th April, 2019
Time: 2.30pm – 4.30pm

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS

a) Briefly describe the mechanism of electric conduction in:
   i) Metals
   ii) Conducting Liquids
   iii) Vacuum (9 Marks)

b) Describe the formation of the P –type extrinsic semiconductor material, using a clearly labeled diagram. (4 Marks)

c) A 6.0V stabilized power supply is required to be produced from a 24V DC power supply input source. The maximum power rating P_{Zmax} of the Zener diode is 0.5W. Using the Zener regulator circuit Figure Q1c. (Assume diode resistance $R_D = 0\Omega$) calculate;

   i) The total supply current I_S at full load.
   ii) The diode current I_Z, if a load resistor of $5k\Omega$ is connected across the Zener diode.
   iii) The minimum value of the series resistor, R_S

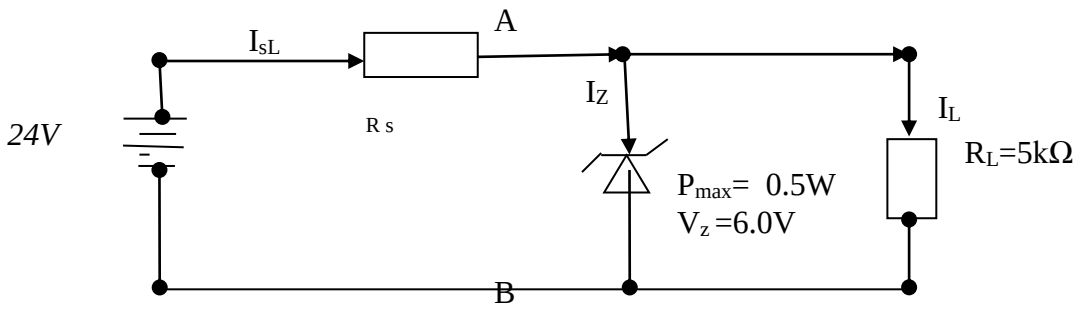

Figure Q1c. (9 Marks)

d) Using both, a labeled block diagram, and a circuit diagram, describe the following configurations of a properly biased PNP bipolar junction transistor:

i) Common Base

ii) Common Emitter (8 Marks)

QUESTION TWO (20 MARKS)

a) An instantaneous current, i=600 sin ωt mA flows through a pure resistance of 5 kΩ .Find the current value flowing and power dissipated in the resistor when $\omega t = 0.75\pi$ rad.

(10 Marks)

b) A transistor has $\alpha_{dc} = 0.85$. Calculate β_{dc}.

(6 Marks)

c) A transistor has the following currents: $I_B = 40\ mA$ *and* $I_C = 5\ A$. Calculate I_E.

(4 Marks)

QUESTION THREE (20 MARKS)

a) Explain with the aid of a labeled diagram the use of a zener diode in a regulated dc power supply.

(12 Marks)

b) Describe the formation of the P-N junction depletion layer, using a clearly labeled diagram.

(8 Marks)

QUESTION FOUR (20 MARKS)

a) i) What is an operational amplifier (Op Amp)? (4 Marks)

ii) State FOUR ideal characteristics of an Op Amp (4 Marks)

b) In the non-inverting OP-AMP, Figure Q4, if R_1=1.5 k Ω, R_f =15 k Ω, calculate:

i) Voltage gain

ii) Output voltage if V_{in}= 100 mV

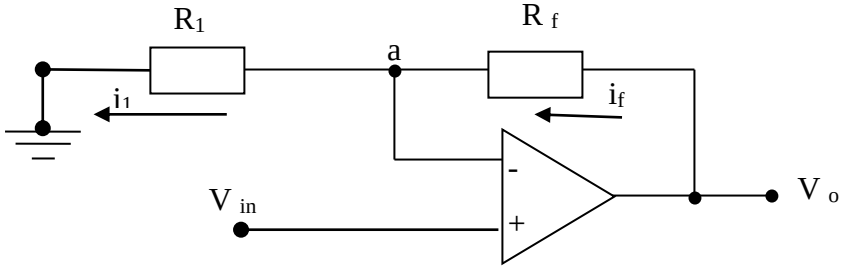

Figure Q 4

(12 Marks)

QUESTION FIVE (20 MARKS)

a) In Fig.Q5a, Calculate the drain current, I_D,for the following values of V_{GS} (assume $V_{DS:} \geq V_{DS(P)}$):

i) 0V,

ii) -0.5V,

iii) -1V

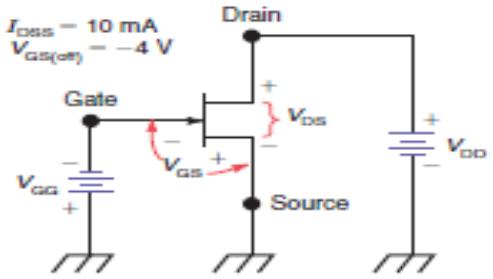

Fig.Q5a

(12 Marks)

b) Describe and show on same figure how the following breakdown mechanisms occur in *p-n* junctions:

i) Zener Effect.

ii) Avalanche Effect.

(8 Marks)