



UVA WELASSA UNIVERSITY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF SCIENCE & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY
END SEMESTER EXAMINATION – SEMESTER I – 2007/2008
ENG 201-2 ELECTRICITY AND BASIC ELECTRONICS



Time Allowed: **2 HOURS**

Number of questions: Six (06)
Number of pages: Four (04)

Instructions:

Paper consists of two(02) parts (Part1 and Part 2).

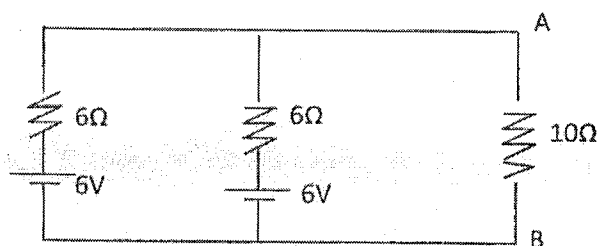
Answer five (05) questions only. You have to answer at least one(01) question from each part.

Answer PART 1 and PART 2 on separate answer books

Clearly state any assumptions made.

PART I

- Q1:
1. What is the difference between an active element and a passive element?
 2. State Thevenin's Theorem using standard terminology.
 3. Determine Thevenin's equivalent circuit to the left of AB



4. A Wheatstone bridge ABCD is arranged as AB=100Ω, BC=99Ω, CD=1000Ω and DA=1000Ω. A battery of emf 10V is connected between A and C with A positive. A galvanometer of resistance 100Ω is connected between B and D. Determine the galvanometer current using Thevenin's theorem.

- Q2:
1. What are the essential components of a generator?
 2. State five principle components of a DC machine and explain the purpose of each briefly.
 3. Draw circuit diagrams of series generator and shunt generator.
 4. The resistance of field circuit of a shunt generator is 200Ω when the output of the generator is 100kW. The terminal voltage is 500V and generator emf 525V, calculate armature resistance.

Q3:

1. Explain the operation of a DC motor.
2. What is back emf.
3. Explain self speed regulation property of a DC motor.
4. 220V shunt motor takes a total current of 80A and runs at 800rpm. Shunt field resistance and armature resistance are 50Ω and 0.1Ω respectively. If iron and frictional losses amount to 1600W, find
 - (a) Copper loss
 - (b) Armature torque
 - (c) Shaft torque
 - (d) Efficiency of the motor.

Q4:

1. With the help of a power triangle explain True power, Reactive power and Apparent power.
2. What is power factor
3. What is voltage transformation ratio in a transformer?
4. A single phase 50 Hz transformer has 20 primary turns and 273 secondary turns. Net cross section area of core is 400cm^2 . If the primary winding is connected to 230V, find
 - (a) Peak value of flux density
 - (b) Secondary voltage

PART 2

- Q5:
1. Describe thermionic emission of a metal? Briefly explain the functionality of a vacuum tube diode using a diagram.
 2. Give two practical applications of a diode?
 3. What is the typical forward biased voltage drop of a Silicon Rectifier Diode?
 4. The exact current through a diode is given by the equation $I_D = I_S e^{\left(\frac{qV}{NkT} - 1\right)}$

Where I_D = Diode Current

I_S = Saturation Current

e = Eulers Constant (2.7182828)

q = Charge of an electron (1.602×10^{-19} coulombs)

V = Voltage across diode

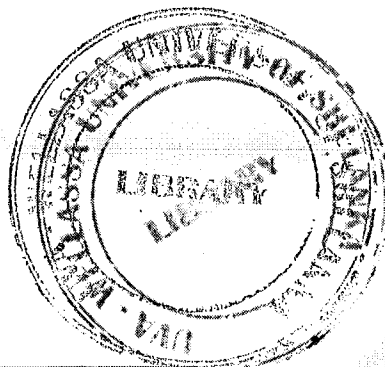
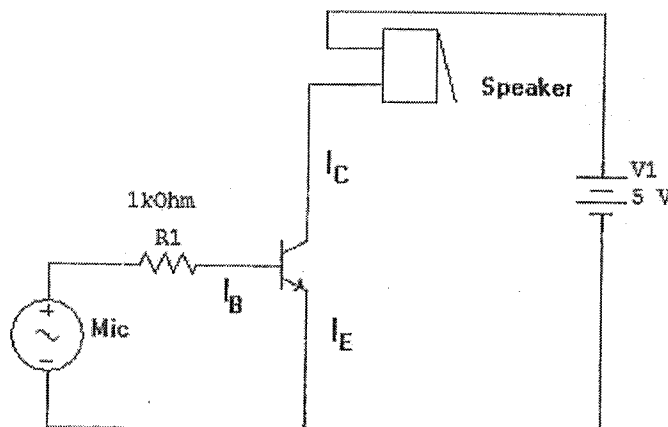
N = Non ideality constant (≈ 1)

k = Boltzmann Constant

T = junction temperature in Kelvin

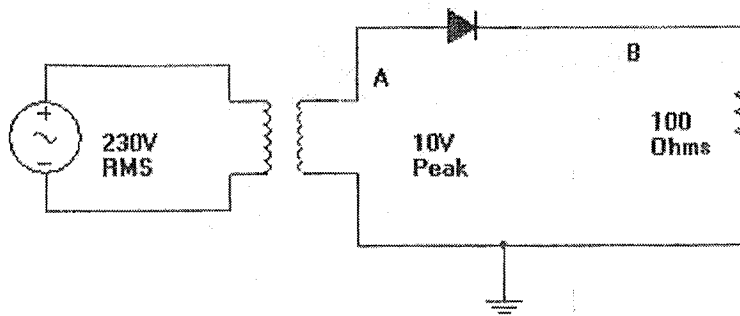
Show that if we keep I_D constant a diode can be used as a temperature sensor by measuring the voltage (V) across the diode?

- Q6:
1. The following is a circuit diagram of a BJT transistor used in a practical application
At a given moment, If $I_B = 10\mu A$ and $h_{FE} = 100$ what is the current through speaker (I_C)?

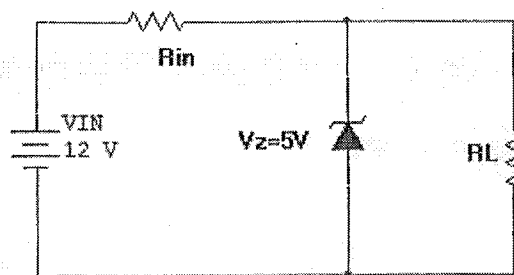


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2. In the following circuit draw the waveforms the voltage of given points A, B with respect to ground.



3. In the above circuit if we add a 100 μ F capacitor parallel to resistor, draw the waveform of point B
4. Consider the following circuit involving a Zener diode



- A. If the supply voltage (V_{IN}) is 12V and zener voltage V_Z is 5V find the current through load resistor R_L and input resistor R_{IN} .
- B. If we change the supply voltage to 10V and load resistor to 500Ω find the current through load resistor R_L and input resistor R_{IN} .
- C. If the supply voltage is dropped to 4V find the current through load resistor R_L and input resistor R_{IN} .