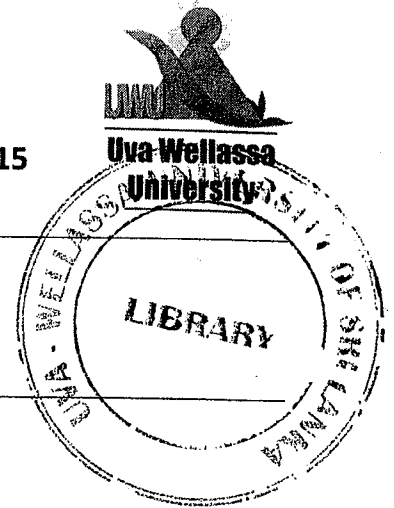


Uva Wellassa University of Sri Lanka
 Faculty of Science and Technology
 Department of Computer Science and Technology
 100 level 2nd Semester Examination – Sept. / Oct. 2015
 SCT 162-1 Basic Electricity and Electronics



Instructions to candidates:

Duration: **One (01) hours**

Number of questions: **Two (02)**

Mark allocation: **100**

1

a.

- i. Define the terms **Thevenin Voltage (e)** and **Thevenin (Norton) Resistance (r)** using the following schematic diagrams (Figure 1.a and Figure 1.b).

(5 x 2 = 10 mark)

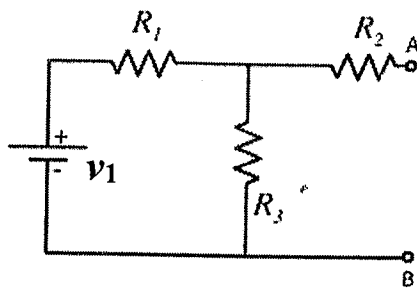


Figure 1.a

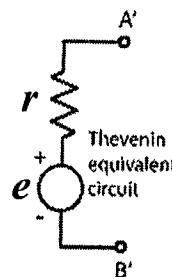


Figure 1.b

- ii. Derive the relationships between e , V_1 , R_1 , R_2 , R_3 and r .

(5 x 2 = 10 mark)

- iii. Calculate R_2 When $e = 4V$, $V_1 = 6V$, $R_1 = 15 \Omega$, $R_3 = 30 \Omega$ and $r = 30 \Omega$.

(5 mark)

b.

- i. Explain the functionality of a DC shunt generator in terms of armature current (I_a), shunt field current (I_{sh}) and load current (I_L) using an appropriate diagram.

(10 mark)

- ii. A 100KW, 240 V shunt generator has a field resistance of 55Ω and armature resistance of 0.067Ω . Find the full-load generated voltage.

(15 mark)

2.

- a. Draw the waveform through the R_L resistor in the Figure 2.1.

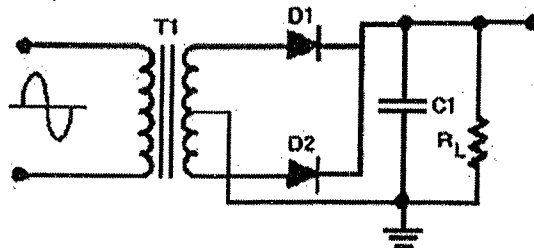


Figure 2.1

(10 mark)

b.

- i. Given output voltage of T1 transformer in above 2.a. (Figure 2.1) is 6.3 V A.C. Assuming the built-in potential (voltage barrier) for a silicon diode is approximately 0.7 V, find the total voltage drop, hence the output D.C. voltage of the circuit in Figure 2.1. (5 mark)
- ii. Describe how to build a 5V D.C. power supply using a zenor diode in addition to the components found in above 2.a. (Figure 2.1) circuit. (Hint: You may require additional resistor(s). Determine the value(s) of the / those resistor(s) using appropriate theoretical principles. Clearly state the calculations including the intermediate steps.) (10 mark)

- c. The principle of "Darlington Couple of BJT (Bipolar Junction Transistor)" can be applicable when the Current Gain (β or $h_{fe} = I_{CE} / I_{BE}$) of a single BJT is inadequate to operate the load. (Or to obtain more gain / amplify weak input signals.) (Refer Figure 2.2)

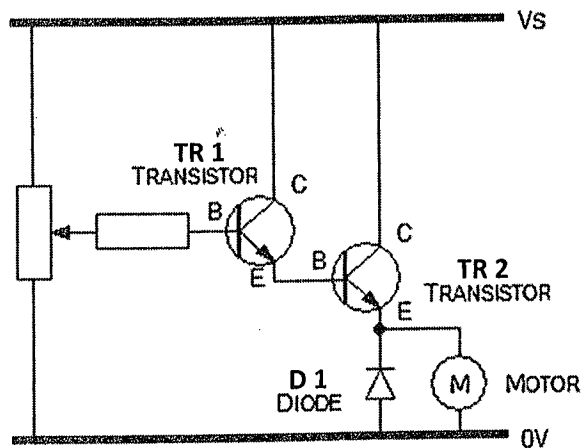


Figure 2.2

- i. If the two transistors TR1 and TR2 of Figure 2.2 are identical, what is the overall Current Gain (β) of the Darlington Couple? (10 mark)
- ii. Suppose base current of TR 1 (I_B) = 0.01 A and β_1 (TR 1) = β_2 (TR 2) = 80. The power source can provide a maximum of 3.0 A current. What is the current that flows through the motor M? (10 mark)
- iii. What is the functionality of the diode D1 in Figure 2.2? (5 mark)