Code No: R09220203 **R09** **Set No. 2**

II B.Tech II Semester Examinations,APRIL 2011
ELECTRONIC CIRCUITS
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Derive the expression, with necessary diagrams, to calculate the total harmonic distortion 'D' in power amplifiers using the five-point method of analysis. [15]

2. (a) The gain of an amplifier is decreased to 1000 with negative feedback from its gain of 5000. Calculate the feedback factor and amount of negative feedback in dB?
   (b) Classify types of feedback amplifiers based on the parameters sampled and feedback. [7+8]

3. (a) Classify various oscillators based on output waveforms, circuit components, operating frequency and feedback used.
   (b) Draw the circuit diagram of RC phase shift oscillator using BJT, Derive the expression for frequency of oscillations. [7+8]

4. (a) With the help of a neat circuit diagram source capacitance of a Common Emitter amplifier explain
      i. The effect of C_s on low frequency response
      ii. The effect of C_c on low frequency response
      iii. The effect of C_e on low frequency response.
   (b) i. Define frequencies f_β, f_α, f_T.
      ii. Prove that $f_T = h_{fe} f_\beta$. [7+8]

5. (a) With neat sketches and necessary expressions, explain the affect of temperature on the saturated junction voltages of a transistor.
   (b) For the CE transistor circuit shown in Figure 1, $V_{CC} = 15V$ and $R_C = 1.5K$. Calculate the power dissipation in the transistor, when it is in
      i. cut-off
      ii. saturation. [7+8]

6. (a) Draw the circuit diagram of an emitter-coupled clipping circuit and draw its transfer characteristics.
   (b) The input voltage Vi to the clipper shown in Figure 2 below is a 20 micro.sec. pulse whose voltage varies between 0 and 20V. If $R_f = 100\ \Omega$, $V\gamma = 0.5$ V and $R_r = \infty$, sketch the output wave form, V_O and indicate the time constants of the exponential portions. [5+10]

Code No: R09220203 **R09** **Set No. 2**

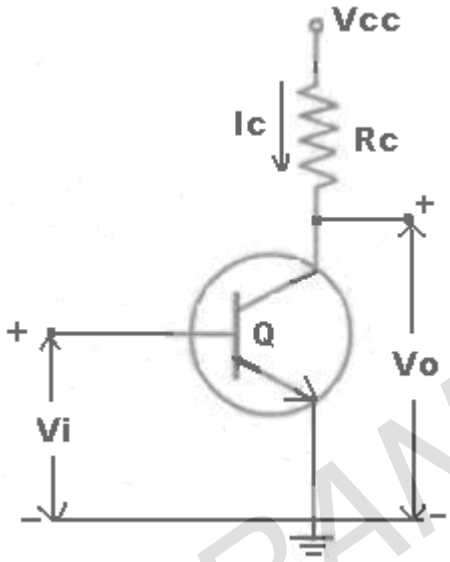

Figure 1:

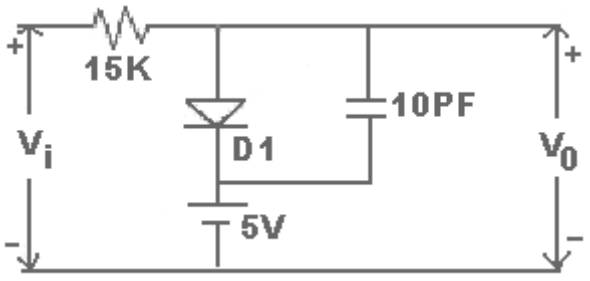

Figure 2:

7. (a) Draw the circuit diagram of CB amplifier using h-parameters derive the expression for current gain, voltage gain, input resistance and output resistance.

   (b) Draw the circuit diagram and low frequency equivalent circuit of common source amplifier and derive the expression for its voltage gain. [7+8]

8. (a) With reference to multivibrators, explain:

   i. stable-state

   ii. loop-gain

   iii. quasi stable-state

   (b) For the given circuit shown in Figure 3, find UTP & LTP. What is this circuit called? Data given $h_{fe(min)} = 40$, $V_{CE(sat)} = 0.1$ V, $V_{BE(sat)} = 0.7$ V, $V\gamma = 0.5$V, $V_{BE(active)} = 0.6$V. [6+9]

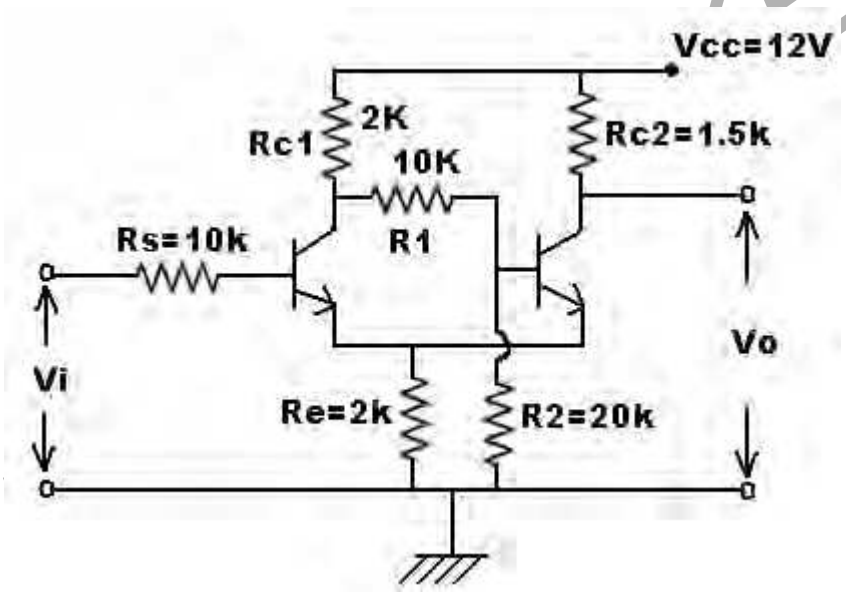

Figure 3:

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1. (a) Using the approximate model derive expressions for current gain, voltage gain, input impedance and output impedance of CC Amplifier.
   (b) Explain the operation of Common Source FET Amplifier. [7+8]
2. In an RC phase shift oscillator if the frequency of oscillations is 955 Hz and R_1= R_2= R_3= 680 kΩ find the value of capacitance in the feedback path. [15]
3. Describe multivibrators from the viewpoints of construction, principle of working, classification based on the output states, applications and specifications. Mention one specific application of each. [15]
4. (a) Show that the decibel gain of multistage amplifier is sum of decibel gains of each stage.
   (b) Given the following transistor measurements made at I_C = 5mA, V_{CC} = 10V and at room temperature, h_{fe} = 100, h_{ie} = 600Ω, |A|=10 at 10 MHz C_e=3pF, find f_T,f_β, r_{be}' and r_{bb}'. [7+8]
5. (a) For the circuit shown in Figure 4, V_i is a sinusoidal voltage of peak 75 volts. Assuming ideal diodes, sketch one cycle of output voltage. Determine the maximum diode currents.

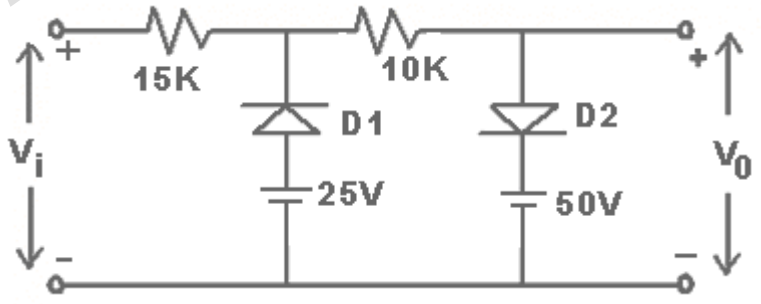

Figure 4:

   (b) What are the uses of clipper circuits? [12+3]
6. (a) Write short notes on requirement and types of heat sinks for power dissipation in large signal amplifiers.
   (b) With the help of a neat circuit diagram, explain the operation of a complementary symmetry configured class B power amplifier.

(c) Compare and contrast push-pull and complementary-symmetry configurations for class B power amplifiers. [5+5+5]

7. (a) Draw the practical circuit diagram of current shunt feedback and find the voltage gain, input and output resistance.

(b) Calculate gain, R_{if} and R_{of} of voltage series feedback having β = -1/20, A = -300, R_i= 1.5 kΩ, R_o= 500 kΩ. [7+8]

8. (a) Consider the transistor switch in CE configuration shown in Figure 5, operated with V_{cc} = 12V and V_{bb} = 0V. It is given that R2 = 2R1 = 68K, Rc =2.2k. Determine the values of I_B and I_C of the transistor. What is the minimum value of h_{FE} for the transistor to operate in saturation when it is in ON state?

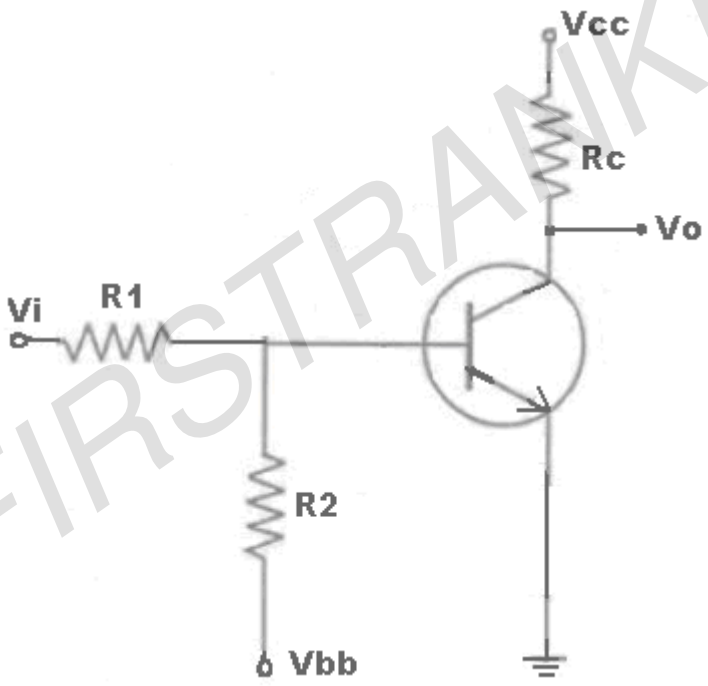

Figure 5:

(b) Explain Zener & Avalanche breakdown mechanisms in diodes. [10+5]

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Code No: R09220203 **R09** **Set No. 1**

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1. (a) State and explain Barkhausen criterion, what are the four topologies of Feedback amplifier, explain the type of sampling and mixing signals in each topology.
   (b) Draw the circuit diagram of voltage series feedback amplifier and derive expression for input and output resistance. [7+8]
2. Draw and explain the circuit of Monostable Multivibrator with necessary waveforms and also derive the expression for pulse width. [15]
3. Calculate the output levels of the following circuit (Figure 6) for inputs of 0 and -6 Volts and verify that the circuit is an inverter. What is the minimum value of h_{FE} required? Neglect junction saturation voltages and assume an ideal diode. [15]

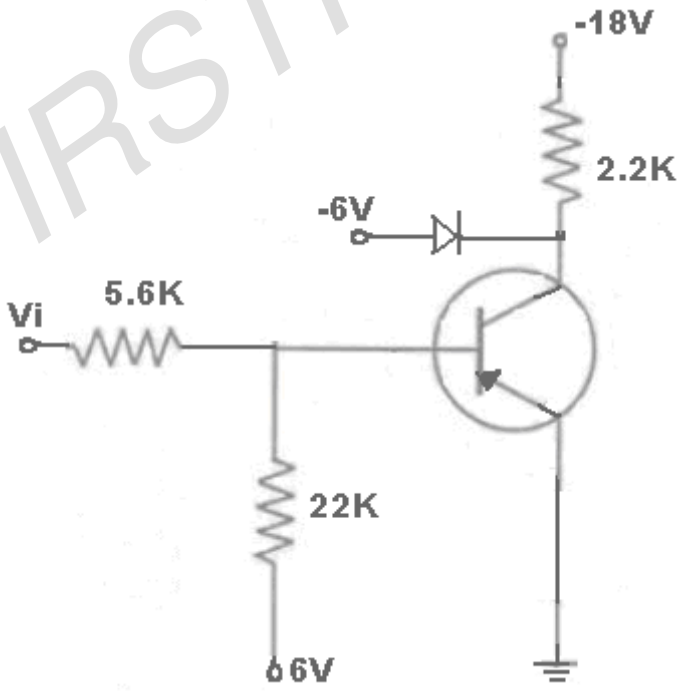

Figure 6:

4. (a) Discuss and explain basic circuit of LC oscillator and derive condition for oscillations.

(b) A quartz crystal has following constants L = 50mH, C_1 = 0.02pF, C_2 = 12pF and R = 500Ω, calculate series and parallel resonating frequencies, if the external capacitance across the crystal changes from 5pF to 6 pF find the change in frequency of oscillation. [7+8]

5. The circuit shown in Figure 7 has load of 8Ω and is operated with a sinusoidal input. Calculate:

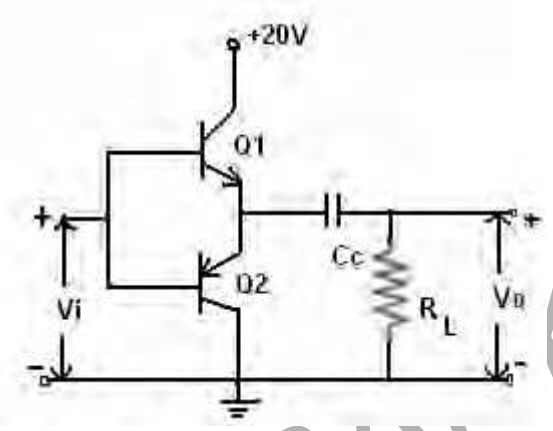

Figure 7:

(a) Maximum AC power output

(b) Power dissipation in each transistor

(c) Conversion efficiency at maximum power output. [15]

6. (a) State and prove clamping circuit theorem.

(b) A clamping circuit and square wave input with T1 = 100μsec & T2 = 1000μsec is shown in Figure 8. Calculate and plot to scale the steady state output. Assume diode forward resistance, R_f = 100Ω. [5+10]

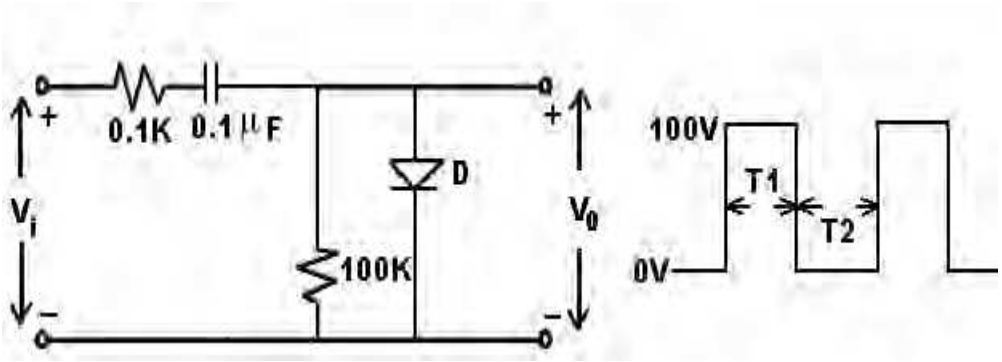

Figure 8:

7. (a) For a single stage transistor amplifier R_s= 10 kΩ, R_L=10kΩ, h_{ic}=1.1 KΩ, h_{rc}=1, h_{fc}= -51 and h_{oc}=25μA/V. Find out current and voltage gain with source resistance, input and output impedance.

(b) Draw the circuit diagram of emitter follower and derive expressions for current gain, voltage gain, input and output impedance. [7+8]

8. (a) Show that the decibel gain of cascaded system is $G_v = G_{v1} + G_{v2} + G_{v3} + - - - - + G_{vn}$ other $G_{v1}, G_{v2}, - - - - -$ - G_{vn} are gains of individual stages.

(b) Show that for low frequency response of CE amplifier the gain in dB is given by, $A_{v(dB)} = -20 \log_{10}(f/f_1)$ where f_1 is the lower cut of frequency. [15]

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1. A transformer coupled class-A power amplifier drives an 8Ω loud speaker through a transformer with turns ratio 20:1. The supply voltage is 24V, and the circuit delivers 4W to the load. Find
   (a) Primary input power
   (b) RMS value of secondary voltage and current
   (c) Efficiency, if the operating collector current is 400mA. [15]

2. (a) For a CE transistor circuit shown in Figure 9, V_{CC} = 15V, R_C = 1.5K and I_B = 0.3mA. Determine the minimum value of h_{FE} required for saturation to occur.

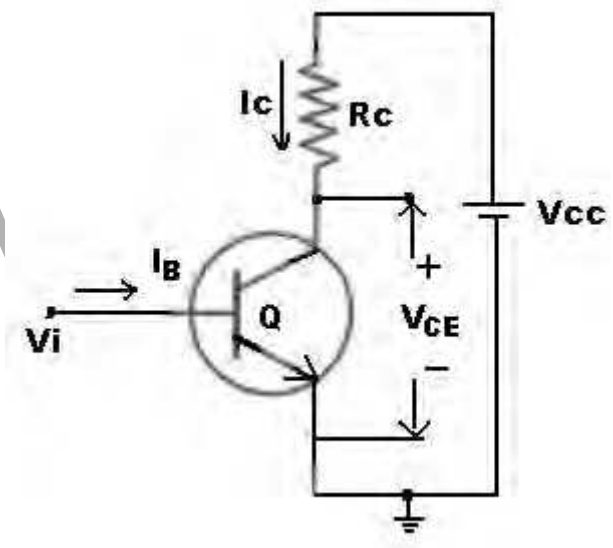

Figure 9:

   (b) Explain about breakdown voltage considerations of transistor. [10+5]

3. (a) Explain with suitable circuit diagrams how voltage series feedback can be done in an amplifier. Obtain the expression for its closed loop gain.
   (b) What are the different types of feedback? Explain how the input and output impedances of an amplifier are affected by different types of feedback? [7+8]

4. (a) Write a short notes on crystal oscillator, and explain what piezo electric effect?

(b) In a transistorized Hartley oscillator the two inductances are 2 mH and 20μH while the frequency is to be changed from 950 kHz to 2050 KHz, calculate the range over which the capacitor is to be varied. [7+8]

5. (a) Discuss the factors influencing the low frequency response of a common source ampifier.

(b) Determine the lower cut off frequency for the circuit given below in Figure 10 using the following parameters, C_s = 10μF, C_e = 20 μF, C_C = 1μF, R_S = 1 kΩ, R_1 = 40 kΩ, R_2 = 10 kΩ, R_e = 2 kΩ, R_C = 4kΩ, R_L = 2.2kΩ, β = 100, V_{CC} = 20V. Assume any parameter values required. [7+8]

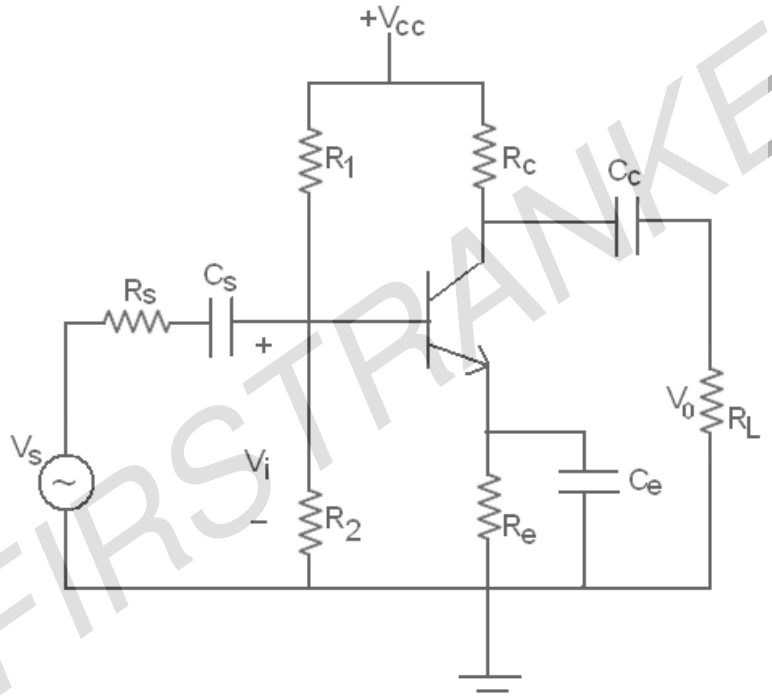

Figure 10:

6. (a) For the circuit shown in Figure 11, R_s = 100Ω, R = 10 K, C = 1.0μF and diode forward resistance, R_f = 100Ω. At t = 0, symmetrical square wave is applied with an amplitude of 10V and a frequency of 5 KHz. Sketch the output wave form for the first two cycles.

(b) Explain the effect of diode characteristics on clamping voltage. [10+5]

7. For the circuit shown below in Figure 12, find Z_i, Z_o, A_v and A_i with h-parameters as h_{ie} = 2.7KΩ, h_{re} = 2$\times 10^{-4}$, h_{fe} = 180 and h_{oe} = 25μs. [15]

8. (a) For the circuit shown in Figure 13, V_{CC} = 18V, V_{BB} = 6V, V = 6V, R_C = 1.5K, R1= 5K, R2= 25K and h_{FE}(min) of each transistor is 40. Neglect the drop across the forward biased junctions. Indicate all the circuit voltages in the quiescent state and indicate also the voltages immediately after a 5V positive step is applied.

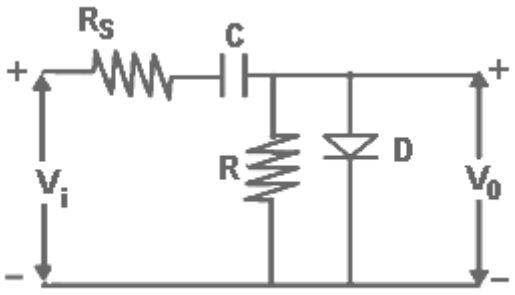

Figure 11:

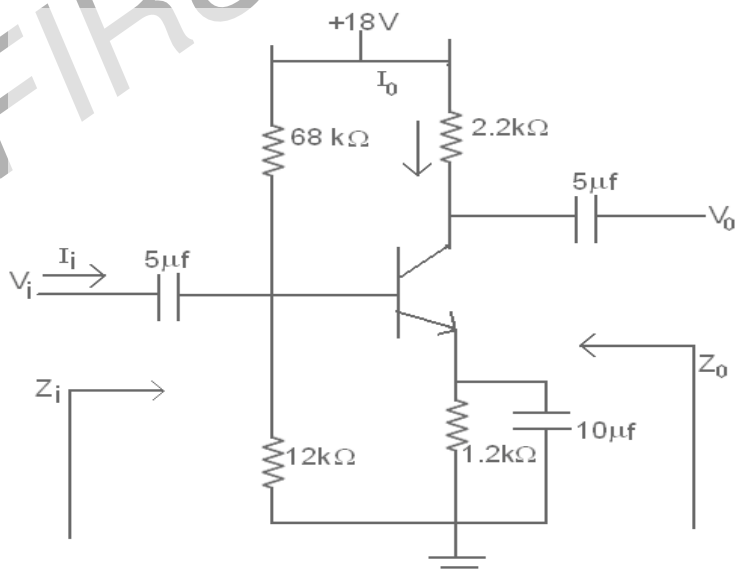

Figure 12:

(b) Find the maximum load the bistable multivibrator, shown in Figure 13 can drive? [10+5]

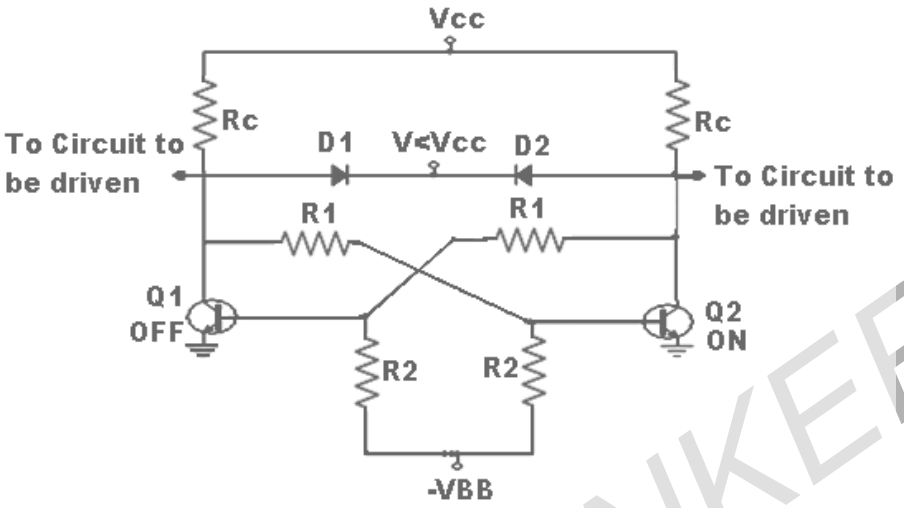

Figure 13:

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