Code No: RR221003 **Set No.1**

II B.Tech. II Semester Regular Examinations, April/May -2005
PULSE AND DIGITAL CIRCUITS
(Common to Electronics & Instrumentation Engineering,Bio-Medical Engineering and Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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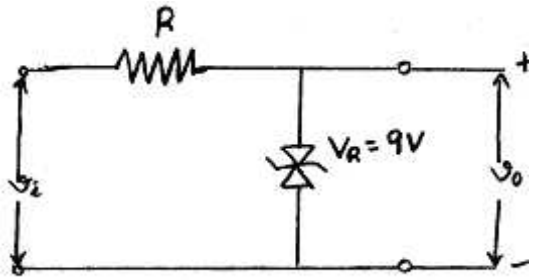
1. (a) For a parallel RLC circuit an input V_i is applied. Derive the Q factor of the circuit.
   (b) Draw the response of the circuit for step input critically damped and over damped cases for a fixed value of R and C.

2. (a) Draw the circuit diagram of a double clipping circuit using diodes to clip at two different reference levels and draw its transfer characteristic and explain its operation.
   (b) For the circuit shown in the figure below: sketch the input and output waveforms.



   If $V_i = 20 \cos \omega t$, R = 2 KΩ

3. Define and explain in detail transistor switching times with necessary circuit and waveforms.

4. A Self-bised binary uses n-p-n silicon transistors having values of $V_{ce}(sat) = 0.4v$, $V_{be}(sat) = 0.8v$ and zero base to emitter voltage for cutoff. The circuit parameters are Vcc = 20v, Rc = 4.7kΩ, *and* R_1= 30kΩ, R_2= 15kΩ and R_e= 390Ω.
   (a) Find the stable-state currents and voltages.
   (b) Find the minimum value of h_{fe} required to give the values in part (a)

5. (a) Draw the circuit of a monostable bootstrap time-base generator and explain its working.
   (b) What is the effect of Recovery interval on the sweep output? How do you get minimum recovery time in a bootstrap time base circuit?

6. (a) Explain the principle of "synchronization" and 'synchronization with frequency division'.
   (b) Explain the method of pulse synchronization of relaxation devices, with examples.
7. (a) Differentiate a sampling gate from logic gate with an example?
   (b) Discuss about sampling gates in detail.
8. (a) Explain the triggering arrangement for blocking oscillator.
   (b) Discuss the effect of switching due to magnetic saturation. Show the hysteresis and current waveforms.

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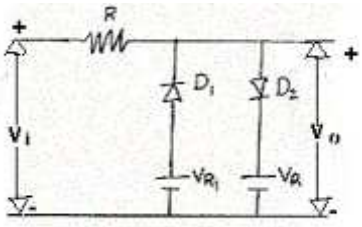
1. (a) Prove that for any periodic input waveform the average level of the steady state output signal from the RC high pass circuit is always Zero.
   (b) Prove the above statement for different periodic input waveforms.
2. (a) Draw the circuit diagram of slicer circuit using Zener diodes and explain its operation with the help of its transfer characteristic.
   (b) For the circuit shown in figure below:



   If R = 1KΩ, V_{R2} = 10V, V_{R1} = 7 V
   R_f = 0 and R_r =∝
   i. Sketch the transfer characteristic
   ii. If V_i = 20 sin ωt sketch the input and output waveforms.
3. When the transistor is used as a switch derive the expression for rise time.
4. (a) What is a self-biased transistor binary? How does it differ with that of fixed biased binary?
   (b) Draw the circuit of a self-biased transistor binary and develop the design steps of analysis.
5. (a) What are the methods used for linearisation of a sweep waveform. Compare these methods. Can you achieve perfect linearity? If, so how?
   (b) The Miller sweep requires ideally an amplifier with a gain $-\infty$, whereas the bootstrap sweep requires a gain +1. But, actually the two circuits are the same. Explain.
6. (a) Explain how a sinusoidal oscillator can be used as a frequency divider.
   (b) Write short notes on
      i. Phase delay and

ii. Phase jitters

7. (a) Illustrate the principle of a linear gate using a series switch?
   (b) How the linear gate can be understood by means of a shunt switch?

8. Explain the recovery and loading considerations in blocking oscillator and the effect of providing damping. Give an alternate circuit to have pulse period independent of RL.

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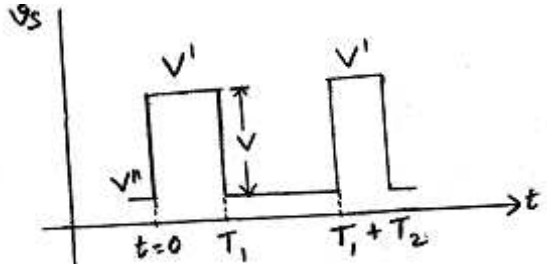
1. Draw the RC High pass circuit, sketch the response of this circuit for exponential input and ramp input. Derive the output equations for the same.

2. (a) State and prove clamping-circuit theorem.
   (b) A square wave input as shown in figure below is applied to the clamping circuit. Sketch the steady-state output waveform and derive the necessary expressions.



3. When the transistor is used as a switch derive the expression for fall time.

4. (a) With the help of a diagram explain the working of a fixed Bias transistor binary.
   (b) The fixed bias binary uses n-p-n silicon transistors with h_{fe}=20. Assume that V_{cc}= 12volts, V_{bb}= 3volts, R_c= 1kΩ, R_1= 10kΩ R_2= 20kΩ. Find the stable state current and voltages if $V_{ce}(sat) = 0$ and $V_{be}(sat) = 0$

5. (a) Draw a circuit of a sweep circuit using a transistor switch. Explain its working with input and output waveforms.
   (b) Compare a transistor-switch sweep circuit with UJT sweep circuit with respect to sweep speed and linearity of sweep.

6. (a) How astable multivibrator can be synchronized? Illustrate with waveforms.
   (b) A symmetrical astable multivibrator using transistor operates from 10V supply has a period of 1msec. Triggering pulses of spacing 750 microsec are applied to one base through a small capacitor from a high-impedance source. Find the minimum triggering pulse amplitude required to achieve 1:1 synchronization.

7. (a) Explain in detail about uni-directional diode gate?

(b) Explain in a uni-directional diode gate how the effect of control voltage can be illustrated.

8. What is meant by blocking oscillator? Explain the principle of a operation monostable blocking oscillator with base timing. Sketch the current waveforms and derive an expression for current pulse width.

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1. Write short notes on Critically damped, underdamped and overdamped case in RLC circuit.

2. (a) Draw the basic circuit diagram of negative peak clamper circuit and explain its operation.
   (b) For the circuit shown in figure below, an input voltage V_i linearly varies from 0 to 150 V is applied. Sketch the output voltage V_0 to the same time scale. Assume ideal diodes.

3. A 20 mA current step is applied in the forward direction to a germanium diode operating at room temperature. The voltage across the current is similar to current step is similar to low amplitude. The rise time (10 to 90 percent) is 100 n- sec. Estimate the diffusion capacitance of a diode at a current of 20 mA.

4. Describe multivibrators from the viewpoints of construction, priniciple of working, classification based on the output states, applications and specifications. Mention one specific application of each.

5. (a) In a current sweep circuit, discuss the effect of stray capacitance shunting across the coil. How do you get linear current sweep in the presence of yoke capacitance?
   (b) Under what conditions, a current sweep circuit will provide precisely linear sweep.

6. (a) Bring out the importance of synchronization and frequency division.
   (b) The relaxation oscillator when running freely, generates an output sweep amplitude of 100V and frequency 1kHz. Synchronizing pulses are applied such that at each pulse the breakdown voltage is lowered by 20V. Over what frequency range may the synchronizing pulse frequency be varied if 1:1 synchronization is to result?

7. (a) How can the uni-directional diode gate can be adopted for more than one signal input?
   (b) Explain threshold gate.

8. Explain with neat circuit diagram triggered blocking oscillator with emitter timing. Draw the equivalent circuit and show the current and voltage waveforms. Derive an expression for current pulse width.

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