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

II B.Tech II Semester Supplementary Examinations, Nov/Dec 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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) A 10-Hz symmetrical square wave whose peak-to-peak amplitude is 2 V is impressed on a high-pass circuit whose lower 3-dB frequency is 5 Hz. Calculate and sketch the output waveform. [14]
   (b) What is the peak to peak output amplitude of the above wave form. [2]

2. (a) For the circuit shown in figure 1 below $R_s = R_f = 100$ ohms, R = 10 K, C= 1.0 micro farad. At t=0 symmetrical square wave is applied with an amplitude of 10V and a frequency of 5KHz, sketch the output wave form for the first two cycles. [8]

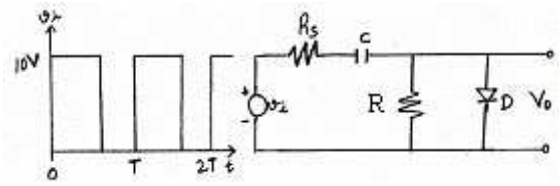

Figure 1:

   (b) In the circuit shown in figure 2 below R_f= 100 ohms, R_r = 10K, V_r=0. Sketch the steady state output voltage indicating all voltages and time constants, for the given input periodic waveform. [8]

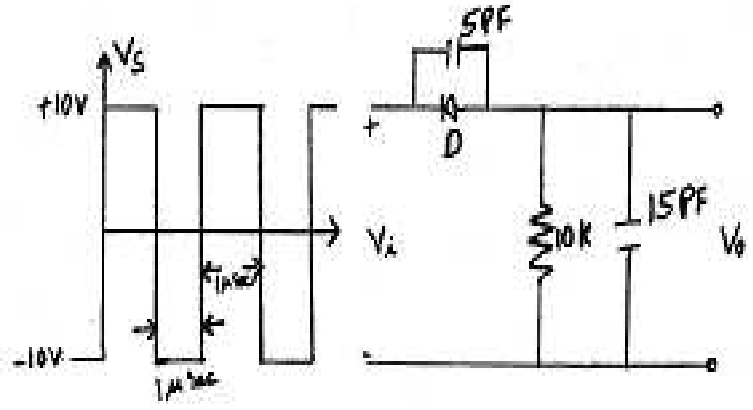

Figure 2:

3. (a) Explain the phenomenon of "latching" in a transistor switch. [6]

   (b) A transistor has f_T = 50 MHz, h_{FE}=40, $C_{b'c}$=3PF and operates with V_{cc}=12 V and R_c=500 Ω. The transistor is operating initially in the neighbourhood of the cut-in point. What base current must be applied to drive the transistor to saturation in 1μ sec? [10]

4. The binary circuit (figure 3) given below uses silicon transistors with h_{FE}=20. Calculate V_1 and V_2, for a sine wave input Vi=10 Sin wt. Plot V_{CN1}, V_{EN}, V_{CN2} as a function of α=wt. (V_1 is the input voltage when Q_1 begins conducting and V_2 is the input voltage when Q_2 resumes conducting.) [16]

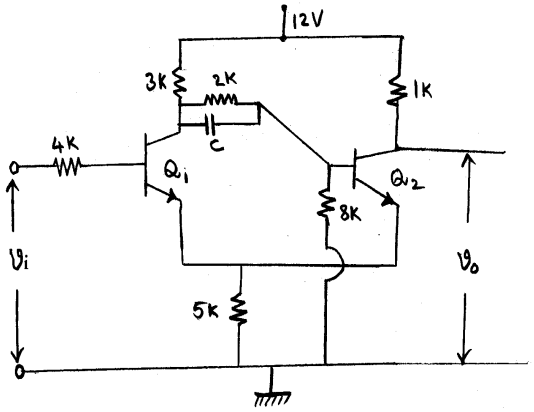

Figure 3:

5. (a) Bring out the necessity and importance of Time base circuits. [6]

   (b) In the UJT sweep circuit, V_{BB} = 20V, V_{yy} = 50V, R=5k, C=0.01 micro F. UJT has η= 0.5. Calculate

   i. amplitude of sweep signal

   ii. Slope and displacement errors and

   iii. estimated recovery time. [10]

6. (a) Bring out the importance of synchronization and frequency division. [8]

   (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? [8]

7. (a) Explain the operation of unidirectional diode sampling gate with neat sketch of waveforms. Illustrate the effect of different levels of control voltage on gate output. [10]

   (b) Discuss the advantages and disadvantages. [6]

8. (a) Compare the diode controlled and RC controlled astable operated blocking oscillator. [6]
   (b) What are the advantages of RC controlled oscillator? [4]
   (c) List the applications of blocking oscillators. [6]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR221003 **Set No. 2**

II B.Tech II Semester Supplementary Examinations, Nov/Dec 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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) A square wave whose peak-to-peak value is 1V extends ± 0.5 V with respect to ground. The duration of the positive section is 0.1 Sec and of the negative section is 0.2 sec. If this wave form is impressed up on an RC differentiating circuit whose time constant is 0.2 sec; what are the steady state maximum and minimum values of the output waveform? [10]
   (b) Prove that the area under the positive section is equal to the area under the negative section of the output waveform of a high- pass RC circuit. [6]

2. (a) State and prove clamping-circuit theorem. [6]
   (b) A square wave input as shown in figure 1 below is applied to the clamping circuit. Sketch the steady-state output waveform and derive the necessary expressions. [10]

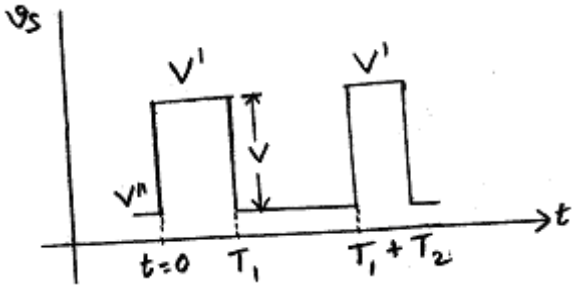

Figure 1:

3. (a) Explain in detail the junction diode switching times. [8]
   (b) Give a brief note on piece-wise linear diode characteristics. [8]

4. What is a monostable multivibrator? with the help of a neat circuit diagram explain the principle of operation of a monostable multi and derive an expression for pulse width. [16]

5. (a) List the methods of generating time-base waveforms. [4]
   (b) Explain with neat diagrams the following methods of linearizing a voltage sweep. [12]
      i. Miller sweep
      ii. Bootstrap sweep

Compare their merits and limitations.

6. (a) Explain the operation of a sweep circuit as a divider. [8]
   (b) The UJT relaxation oscillator is to be used as a 3:1 divider for pulses which occur at a 2500 Hz rate. The available supply voltage is 30 V. The pulses are applied at base B_2. Draw the circuit and calculate pulse amplitude. [8]

7. (a) Explain the operation of unidirectional diode sampling gate with neat sketch of waveforms. Illustrate the effect of different levels of control voltage on gate output. [10]
   (b) Discuss the advantages and disadvantages. [6]

8. In the circuit (figure 2) shown below all the windings have the same number of turns and the core has a rectangular hysteresis loop characteristic. If the blocking oscillator is triggered at t = 0, prove that at t = 0+, [16]
   (a) the current in the reset winding is $3V_{CC}$ / 2 R_r
   (b) the collector current is V_{CC} / 4 [1/R + 1/ R_r + 1/R

   (Hint : The sum of the ampere turns cannot change at t = 0. This sum is not zero)

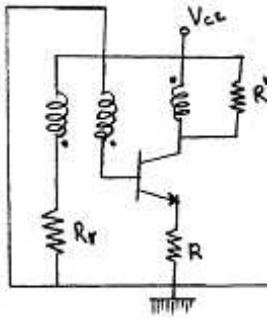

Figure 2:

⋆ ⋆ ⋆ ⋆ ⋆

II B.Tech II Semester Supplementary Examinations, Nov/Dec 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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) The periodic ramp voltage shown is applied to a low pass RC circuit. Find the equations from which to determine the steady state output waveform. (figure1) [8]

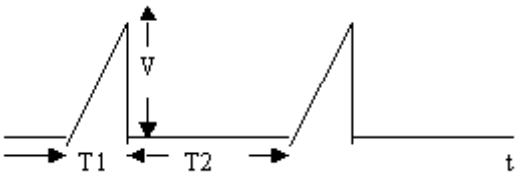

Figure 1:

(b) If T_1=T_2=RC, find the maximum and minimum value of the output voltage and plot this waveform. [8]

2. (a) Discuss the effect of Diode characteristics on clamping voltage. [6]

(b) A symmetrical square wave of 100 Hz whose peak to peak amplitude is 20V is applied to the circuit shown in figure 2 below. Sketch the steady state output waveform indicating clearly the voltage levels and time constants. Assume that the diode has zero cut-in voltage, 100Ω forward resistance in infinite reverse resistance. [10]

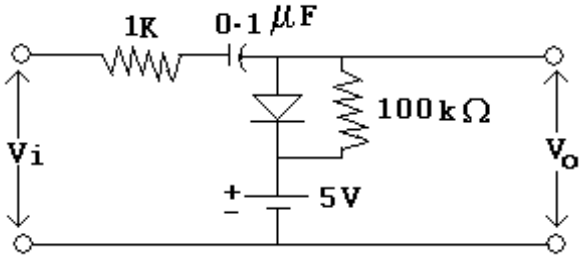

Figure 2:

3. (a) Explain how transistor can be used as a switch in the circuit, under what condition a transistor is said to be 'OFF' and 'ON' respectively. [6]

(b) A germanium transistor is operated at room temperature in the CE configuration. The supply voltage is 6 V, the collector-circuit resistance is 200 Ω and

the base current is 20 percent higher than the minimum value required to drive the transistor into saturation. Assume the following transistor parameters: I_{co}=-5μA, I_{EO}=-2μA, h_{FE}=100, and $r_{bb'}$=250 Ω. Find V_{BE}(Sat) and V_{CE}(Sat). [10]

4. (a) Discuss the symmetrical and Asymmetrical triggering in case of Bistable transistor multivibrator. [8]
   (b) For the given circuit ,find UTP & LTP. What is this circuit called? Data given h_{fe}(min)=40, V_{CE}(sat)=0.1 V, U_{BE}(sat)=0.7 V V_r=0.5V, V_{BE}(active)=0.6V. [8](figure 3)

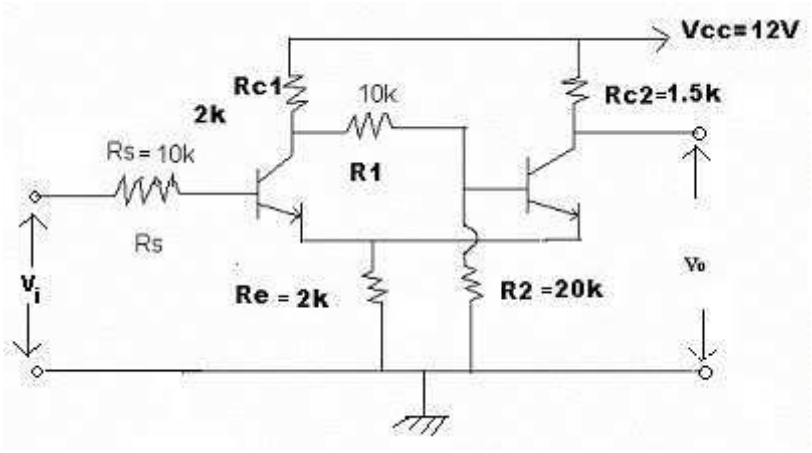

Figure 3:

5. With reference to voltage sweeps explain the following terms: [16]
   (a) Sweep speed
   (b) Linearity of sweep
   (c) Sweep stability
   (d) Recovery time.

6. (a) Illustrate the terms 'synchronization' and 'frequency division' of a sweep generator. [8]
   (b) A free-running relaxation oscillator has sweep amplitude of 100 V and a period of 1 msec synchronizing pulses are applied to the device such that breakdown voltage is lowered by 50 V at each pulse. The synchronizing pulse frequency is 4 kHz. What is the amplitude and frequency of synchronized oscillator waveform? [8]

7. (a) State the effects of circuit capacitances? [6]
   (b) How circuit capacitance influence transmission in a bi-directional gate? [10]

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. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR221003 **Set No. 4**

II B.Tech II Semester Supplementary Examinations, Nov/Dec 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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) The periodic wave form shown is applied to an RC integrating circuit whose time constant is 10 μ sec. Sketch the output. (figure 1) [8]
   (b) Calculate the maximum and minimum values of output voltage with respect to ground. [8]

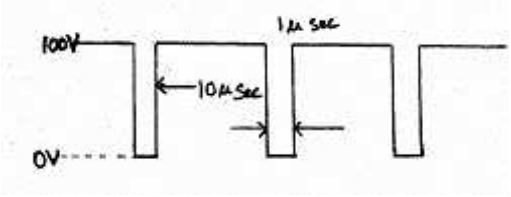

Figure 1:

2. (a) State and prove clamping-circuit theorem. [6]
   (b) A square wave input as shown in figure 2 below is applied to the clamping circuit. Sketch the steady-state output waveform and derive the necessary expressions. [10]

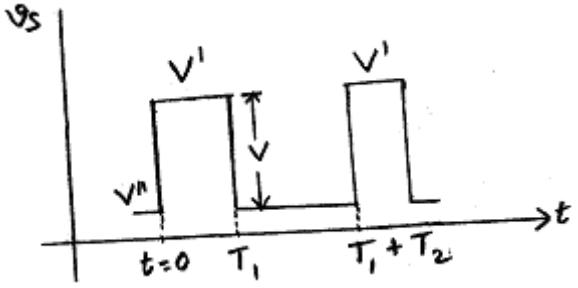

Figure 2:

3. (a) Explain in detail the junction diode switching times. [8]
   (b) Give a brief note on piece-wise linear diode characteristics. [8]

4. Design a collector-coupled monostable multi to obtain an output pulse of amplitude 6v and a gating time of 20usec,I_c (sat)=6mA,the base drive required for the ON transistor is 2 times I_B(min). Assume that V_{CE} (sat)=0,V_{BE} (sat)=0& h_{fe}(min)=20. [16]

5. With reference to voltage sweeps explain the following terms: [16]
   (a) Sweep speed
   (b) Linearity of sweep
   (c) Sweep stability
   (d) Recovery time.

6. (a) Bring out the importance of synchronization and frequency division. [8]
   (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? [8]

7. (a) What is a sampling gate? Explain the operation of series gate using JFET. Sketch the input and output waveforms. [8]
   (b) Illustrate the errors encountered in series sampling and what is the design procedure to minimize these errors? [8]

8. (a) Explain the triggering arrangement for blocking oscillator. [8]
   (b) Discuss the effect of switching due to magnetic saturation. Show the hysteresis and current waveforms. [8]

⋆ ⋆ ⋆ ⋆ ⋆