Code No: 07A4EC07 **R07** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
PULSE AND DIGITAL CIRCUITS
Common to BME, ICE, E.COMP.E, ETM, E.CONT.E, ECE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between sampling gates and logic gates?
   (b) Explain the operation of a chopper amplifier with neat block diagram and waveforms.
   (c) Distinguish between unidirectional and bidirectional gates. [4+8+4]

2. Regeneration is possible in the fixed-bias transistor flip-flop if the base-to-base voltage gain exceeds unity. Verify that this gain condition is satisfied provided that $h_{fe}Rc > R_1$. Assume that for each stage the current gain is $|A_I| = h_{FE} \gg 1$ and that the input resistance R_i is small compared with either R_1 or R_2. [16]

3. (a) Explain how a compensation circuit improves the linearity of a Bootstrap voltage time base generator.
   (b) With the help of neat circuit diagram explain the working of transistor current time base generator. [16]

4. (a) Prove that for any periodic input wave form the average level of the steady state output signal from an RC high pass circuit is always zero.
   (b) Explain how a low pass RC circuit act an integrator and what are the limitations? [8+8]

5. (a) Explain with relevant diagrams, the various transistor switching times
   (b) Explain the storage and transition times of the diode as a switch. [8+8]

6. (a) Draw the basic circuit diagram of a DC restorer circuit and explain its operation. Sketch the out put wave form for a sinusoidal input.
   (b) Draw the basic circuit diagram of positive peak clamper circuit and explain its operation. [8+8]

7. (a) Define positive level logic system and pulse logic system.
   (b) The transistor inverter (NOT gate) circuit has $h_{femin} = 40$, $V_{cc} = 12V$, $R_c = 2.2k\Omega$, $R_1 = 15k\Omega$ and $R_2 = 100k\Omega$, $V_{BB} = 12V$. The input is varying between $-12V$ and $0V$. Assume typical junction voltages of pnp transistor. Prove that this circuit works as NOT gate. [16]

8. (a) With the help of a circuit diagram and waveforms explain frequency division of monostable multivibrator with pulse signals.

(b) A symmetrical astable multivibrator using germanium transistors and operating from a 10V collector supply voltage has a free period of 1000 μsec. Triggering pulses whose spacing is 750 μsec 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. Assume typical junction voltage of the transistor and that the timing portion of the base waveform is linear. [16]

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Code No: 07A4EC07 **R07** **Set No. 4**

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Time: 3 hours Max Marks: 80
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1. (a) What is synchronization? What is synchronization on a one-to-one basis What is synchronization with frequency division? Give an example of synchronization with frequency division.
   (b) What is relaxation oscillator? Explain pulse synchronization of relaxation oscillator with necessary diagrams. [16]

2. Explain about the response of Schmitt Trigger to an arbitrary input signal with appropriate diagram. [16]

3. (a) What is a linear time base generator?
   (b) Write the applications of time base generators.
   (c) Define the sweep speed error, displacement error and transmission error of voltage time base waveform. [16]

4. (a) The input voltage v_i to the two level clipper shown in figure 1 varies linearly from 0 to 150 V. Sketch the output voltage v_o to the same time scale as the input voltage. Assume Ideal diodes.

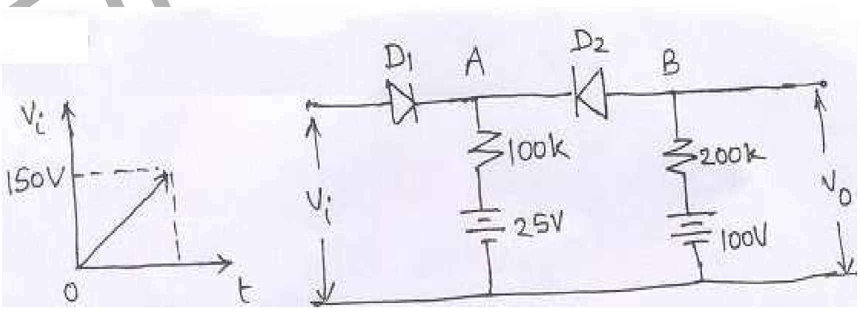

Figure 1:

   (b) Explain about positive peak voltage limiters above reference level. [12+4]

5. (a) Describe the switching times of BJT by considoring charge distribution across the base region. Explain this for cut-off, active and saturation region.
   (b) Give the expressions for rise time & fall time in terms of trunsistor parameters and operating currents. [8+8]

6. (a) Draw the circuit diagram of Emitter - coupled OR gate and explain its operation.

(b) Draw the circuit diagram of negative logic NOR gate and explain its operation. [8+8]

7. (a) With the help of neat diagrams explain the working of bidirectional diode gate and derive the expressions to control voltages and gain.

   (b) For the bidirectional diode gate $V_s = 25V$, $R_F = 50\Omega$, $R_L = R_C = 200k\Omega$ and $R_2 = 50k\Omega$. Find $(V_c)_{min}$, $(V_n)_{min}$, gain A and the 3 - dB frequency of the gate. [16]

8. (a) A symmetrical square wave whose peak-to-peak amptitude is 2V and whose average value is zero is applied to an RC integrating circuit. The time constant is equal to half -period of the square wave. Find the peak to peak value of the output amplitude.

   (b) Describe the relationship between rise time and RC time constant of a low pass RC circuit. [8+8]

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Code No: 07A4EC07 **R07** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) Explain the response of RL circuit when a step input signal is applied
   (b) In a low pass RC ckt, R=2kΩ and C = 1μ F =1.sv, 2ms, pulse is applied as input to this ckt sketch the output wave form. [8+8]
2. Explain the following
   (a) Storage and transition times of the diode as a switch
   (b) Switching times of the transistor. [8+8]
3. (a) Draw the circuit diagram of discrete-component regenerative comparator.
   (b) Draw the transfer characteristic showing hysteresis. [16]
4. (a) Explain the operation of a six - diode gate.
   (b) Write the applications of sampling gates.
   (c) Briefly describe the chopper amplifier and sampling scope. [16]
5. (a) What is phase delay and phase jitter?
   (b) Explain the method of synchronization of a sinusoidal oscillator with pulses.
   (c) Explain the frequency division in sweep circuit. [4+8+4]
6. (a) Explain transfer characteristics of the emitter coupled clipper and derive the necessary equations.
   (b) Draw the basic circuit diagram of positive peak clamper circuit and explain its operation. [8+8]
7. (a) Draw the circuit diagram of diode - resistor logic OR gate and explain its operation.
   (b) The transistor inverter (NOT gate) circuit has a minimum value h_{fe} = 30, V_{CC} = 12V, R_C = 2.2kΩ, R_1 = 15kΩ and R_2 =100kΩ, V_{BB} = 12V. Prove that circuit works as NOT gate. Assume typical junction voltages. The input is varying between 0 and 12V. [16]
8. (a) Bring out the necessity and importance of current sweep circuits. List out its applications.
   (b) Determine the sweep error of the simple current sweep circuit. The component values in the circuit are
   V_{cc}=18v, L=150mH, the yoke resistance R_L= 15Ω, R_S=10Ω and R_d=150Ω. [8+8]

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Time: 3 hours **Max Marks: 80**
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1. (a) Determine V_o for the network shown in figure 2, for the given waveform. Assume ideal diodes.

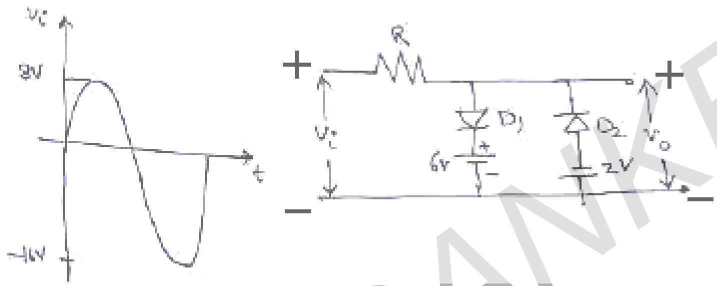

Figure 2:

   (b) Explain negative peak clipper with and without reference voltage. [8+8]

2. What is a monostable multivibrator? Explain with the help of a neat circuit diagram the principle of operation of a monostable multivibrator, and derive an expression for pulse width. Draw the wave forms at collector and Bases of both transistors. [16]

3. (a) Explain the phenomenon of latching in a transistor
   (b) Define the following for a transistor switch
      i. Rise time
      ii. Fall time
      iii. Storage time
      iv. Delay time. [8+8]

4. (a) Compare different logic families.
   (b) Draw the output waveform X for the given inputs figure 4b. [8+8]

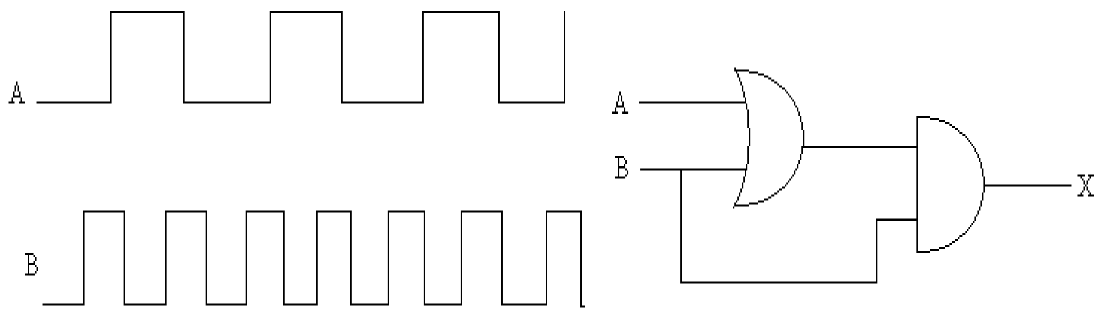

Figure 4b

5. (a) With the help of a circuit diagram and waveforms explain frequency division of an astable multivibrator with pulse signals.
   (b) Explain with the help of block diagram and waveforms for acheiving division of relaxation devices without phase jitter. [8+8]

6. (a) Draw the circuit diagram of the unidirectional diode gate with more than two inputs and explain its operation.
   (b) How do you overcome the loading effect of signal sources on control voltage?
   (c) Draw the circuit diagram of a sampling gate with more than one control voltage and explain its working. [16]

7. (a) Distinguish between Voltage and current time base circuits.
   (b) List out different methods to achieve a linear sweep voltage waveform.
   (c) Design a relaxation oscillator to have 3khz output frequency. Using 2N2646 UJT and a 20v supply. Calculate the sweep amplitude. The specifications from the data sheet are given as η=0.7, I_p=2μA, I_v=1nA and $V_{EB,SAT}$=3V. [4+4+8]

8. (a) Obtain the response of RC high pass cirucit for an exponential i/p signal.
   (b) A square wave whose peak-to-peak value is 1V, extends $\pm$0.5v (0.5V w.r.t. to ground). The half period is 0.1 sec this voltage impressed upon an RC differentiating circuit whose time constant is 0.2 sec. Determine the maximum and minimum values of the O/p voltages in the steady state. [8+8]

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