Code No: V0421 **R07** SET - 1

II B. Tech II Semester, Supplementary Examinations, Dec – 2012
PULSE AND DIGITAL CIRCUITS
(Com. to ECE, ECC, BME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What are the wave shaping circuits? Explain the response of RC low pass circuit for a square Wave input with relevant waveforms.
   b) Show that bandwidth and rise time product of low pass circuit is 0.35.

2. a) State and prove clamping theorem.
   b) Plot the transfer characteristics of the biased double ended clipper. Assume ideal diodes.

3. a) Define rise time, fall time, turn-on time and turn-off time and storage time.
   b) Design a transistor as switch with V_{CC}=15V and V_i = 3V and β=100. Assume any data missing.

4. a) Explain the operation of emitter coupled Bistable multivibrator.
   b) Determine V_{E1}, I_{B2}, I_{C2} and h_{fe} for a Schmitt trigger having the following specifications V_{CC}=15, UTP=5V, LTP=3V, I_{C1}=5mA.

5. a) Distinguish between a Miller integrator and Bootstrap generator.
   b) Explain the operation of a time base generator with relevant waveforms and explain its importance in pulse circuits.

6. a) Define the terms i) Sweep speed error ii) Displacement error and iii) Transmission error.
   b) With a circuit diagram, explain the operation of relaxation oscillator.

7. a) Draw the unidirectional diode gate and explain it samples the input.
   b) Draw the expression for V_{nmin} of a two-diode sampling gate.

8. a) Draw the circuit of 2-input TTL NAND gate with totem-pole output and explain the operation.
   b) With the help of circuit diagram, explain the operation of DTL NAND gate.
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Code No: V0421 **R07** SET - 2

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1. a) Prove that for any periodic input the average value of output of RC high pass circuit is equal to zero under steady state.
   b) A symmetrical square wave of 2 KHz and amplitude 10V is impressed on a RC high pass circuit. If the time constant of the circuit is equal to 0.25m sec. Calculate and plot the output with respect to input under steady state.

2. a) State and Clamping theorem.
   b) Design and draw a diode clipper to clip a given input voltage of 10 sinωt at +5V and -5V level.

3. a) Draw the piece wise linear characteristics of a diode and discuss normal diode characteristics can be linearized.
   b) Draw the transistor as switch circuit and discuss how it acts as switch.

4. a) Explain the operation of a Monostable multivibrator and sketch the waveforms seen at the collectors and bases and obtain the expression for the pulse width.
   b) Design an astable multivibrator to generate 1 KHz and symmetrical square wave of amplitude 12V. Use NPN silicon transistors with h_{fe} = 100, V_{CEsat}=0.3V, V_{BEsat}=0.7V, I_C=100mA.

5. a) Explain the need for trapezoidal waveform for linearity correction in sweep generators.
   b) Draw the circuit of constant current sweep circuit and explain the operation.

6. a) Discuss how the frequency division by a factor 2 is done in sweep generator.
   b) Draw the Monostable relaxation circuit and explain how it is used as divider circuit.

7. a) Explain how the loading of control signal is reduced when number of inputs increases?
   b) Draw and explain the circuit diagram of a six-diode gate.

8. a) Compare the performance of DTL, TTL, ECL and MOS logic families.
   b) Explain the terms Noise Margin, Noise immunity, Fan out, Fan in and Propagation delay.
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Code No: V0421 **R07** SET - 3

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Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
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1. a) If an exponential input $V_i=V(1-e^{-t/T})$ is applied to a RC low pass circuit, calculate and plot the output with respect to input.
   b) Derive the relationship between rise time and time constant of an RC low pass circuit.

2. a) A square wave whose period is 2 msec and amplitude of 40V (p-p) is impressed on a positive clamper circuit. Calculate and sketch steady state output voltage V_0.
   b) Design and draw a diode clipper circuit to clip input of 10 sinωt at +5V and +3V levels.

3. a) For a transistor as switch, calculate rise time (t_r), the time t_{ds} necessary for collector current to rise to 10% of I_{CS}. Assume f_T=10MHz and h_{fe}=100.
   b) Derive equation for the rise time in terms of h_{fe} and collector current (I_{CS}).

4. Design a Schmitt trigger using NPN transistor given V_{CC}=18V, output swing=6V, h_{femin}=60, UTP=3.5V, LTP=1.5V, R_1=10KΩ and R_2=2KΩ. Assume that the output transistor in its active region. Find R_{C1}, R_{C2} and R_E.

5. a) Draw the circuit of constant-current sweep circuit and explain the operation.
   b) Design a sweep circuit with t_r=50 μsec, h_{fe}=20, e_0=4V, I_{CB0}=0, $V_{BB}=V_{CC}$=10V. Assume initial charging current is 10mA. V_{BEoff}=-0.5V and e_{in}=10V pulse.

6. a) Explain the sine-wave frequency division with a sweep circuit with relevant waveforms.
   b) What is the importance of stability in frequency dividers?

7. a) What are the applications of sampling gates.
   b) Illustrate the principle of sampling gates with series and parallel switches and compare them.

8. a) List out the important properties of DTL circuit.
   b) Design a transistor inverted circuit (NOT gate) with the following specifications. $V_{CC}=V_{BB}$=10V, $I_{C,sat}$=10mA, h_{femin}=30, the input is varying between 0 and 10V. Assume typical junction voltages of npn silicon transistors.
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Code No: V0421 **R07** SET - 4

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Time: 3 hours Max. Marks: 80

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1. a) A square wave input of +15V peak to peak at 10KHz frequency is applied to an RC differentiator with R=68KΩ and C=0.002μF. What will be the output waveform across R?
   b) Explain the working of a compensated attenuator.

2. a) Design and draw a diode clipper to clip a given input voltage of 10 sinωt at +5V and -3V level.
   b) Draw the different types of clamping circuits and explain the operation with the help of waveforms.

3. a) Draw the circuit diagram of resistor-capacitor transistor logic switch and discuss switching time with wave forms.
   b) Using a RC parallel circuit at the base of transistor how switching speed can be increased.

4. a) With a circuit diagram explain the operation of astable multivibrator.
   b) Design astable multivibrator for V_0=10V (peak) and the duration of the output pulse is 20 μsec, I_C=10mA, h_{femin}=20, Duration between the pulse is 20 μsec.

5. a) Draw the circuit of Miller's sweep using transistor and explain its operation.
   b) Draw the circuit diagram of UJT relaxation sweep circuit in free running mode.

6. A symmetrical astable multi using Ge 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.

7. a) Derive the expression for V_{cmin} of a Bidirectional sampling gate.
   b) With the help of neat diagram, explain the working of Bidirectional gates using transistors.

8. a) Draw the circuit of two-input NAND gate using DTL logic and explain its operation.
   b) Compare the various parameters of different types of TTL series gates.
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