Code No: R22021 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations January – 2014
PULSE AND DIGITAL CIRCUITS
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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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 circuit, R=2 kΩ and C= 1μF is applied as exponential input to this circuit determine the output wave form. (7M+8M)

2. a) Design a clipping circuit with ideal components, which can give the waveform shown in Figure 1 for a sinusoidal input.

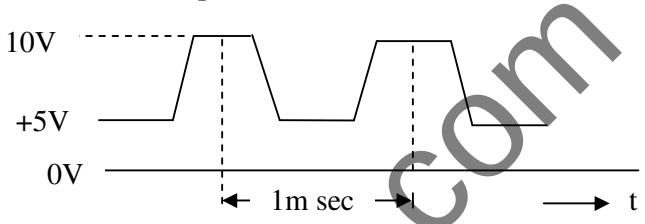

Figure 1

   b) State and prove clamping circuit theorem. (8M+7M)

3. a) Describe the switching times of BJT by considering 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 transistor parameters and operating currents. (8M+7M)

4. a) Explain how a Schmitt trigger can be used as a comparator and as a squaring circuit.
   b) What do you understand by hysteresis? What is hysteresis voltage? Explain how hysteresis can be eliminated in a Schmitt trigger. (7M+8M)
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5. 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. (15M)

6. a) Explain the significance of integrator in Miller sweep circuit.
   b) Explain how a linearly varying current waveform can be generated from voltage time base generator? (7M+8M)

7. a) What is phase delay and phase jitter?
   b) With the help of block diagram and waveforms, explain how division without phase jitter can be obtained using relaxation devices.
   c) Write the factors which influence the stability of a relaxation divider. (15M)

8. a) What is a sampling gate? Explain how it differs from logic gate?
   b) What are the drawbacks of two-diode sampling gate?
   c) Give examples of sampling gate and logic gates. (7M+4M+4M)

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1. a) Explain about RLC Ringing Circuit
   b) Explain RC double differentiator circuit. (8M+7M)

2. a) Draw the basic circuit diagram of positive peak clamper circuit and explain its operation.
   b) Explain transfer characteristics of the emitter coupled clipper and derive the necessary equations. (8M+7M)

3. Write Short notes on:
   a) Diode switching times
   b) Switching characteristics of transistors
   c) FET as a switch. (4M+7M+4M)

4. a) Explain different triggering methods of binary circuits.
   b) What are transpose capacitors? Explain how the commutating capacitors will increase the speed of a fixed-bias binary. (8M+7M)

5. What is a astable multivibrator? Explain with the help of a neat circuit diagram the principle of operation of a astable multivibrator, and derive an expression for pulse width. Draw the wave forms at collector and Bases of both transistors. (15M)

6. a) With the help of a neat circuit diagram and waveforms explain the working of a transistor Miller time base generator.
   b) Find the component values of a bootstrap sweep generator, given V_{cc}=18V, I_c(sat) = 2mA and h_{fe}(min)=30. (8M+7M)

7. 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 achieving division of relaxation devices without phase jitter. (7M+8M)

8. 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. (4M+7M+4M)
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1. a) The output of a high pass RC circuit for a symmetrical square wave input is shown in Figure 1. Derive the expression for percentage tilt in the output.

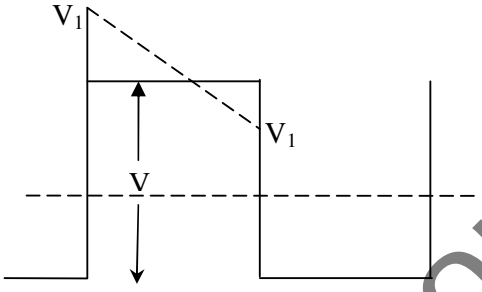

Figure 1

b) Prove that an RC circuit behaves as a reasonably good integrator if RC > 15T, where T is the period of an input '$E_m \sin \omega t$'. (7M+8M)

2. a) The input voltage vi to the two level clipper shown in Figure 2 varies linearly from 0 to 150 V. Sketch the output voltage V_0 to the same time scale as the input voltage. Assume Ideal diodes.

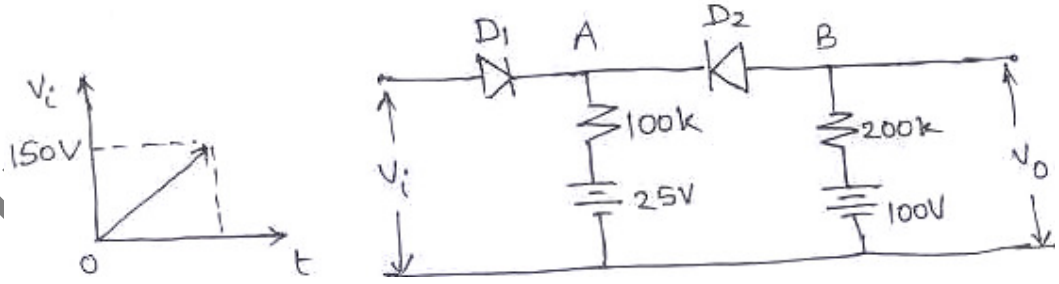

Figure-2

b) Explain positive peak voltage limiters above reference level. (11M+4M)

3. a) Explain with relevant diagrams, the various transistor switching times

b) Explain the storage and transition times of the diode as a switch. (8M+7M)
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4. Explain the operation of emitter-coupled bistable multivibrator. Also discuss different methods of triggering a bistable multivibrator. (15M)

5. a) With the help of a neat circuit diagram explain the working of an emitter coupled Astable multivibrator and derive an expression for the gate width
   b) Design an astable multivibrator to generate a square wave of 5 kHz frequency with a duty cycle of 25%. (7M+8M)

6. 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. (7M+8M)

7. a) Explain the principle of "synchronization" and 'synchronization with frequency division'.
   b) Explain with the help of block diagram and waveforms for achieving frequency division of relaxation devices without phase jitter. (8M+7M)

8. 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 Vs = 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. (8M+7M)

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1. a) What are the applications of RC integrator and differentiator?
   b) Explain the operation of RC low pass circuit for exponential input. (8M+7M)

2. a) Draw the diode differentiator comparator circuit and explain its operation when a ramp input signal is applied.
   b) For a shunt diode clipper circuit $V_i = 20 \sin \omega t$, $V_R = 10V$ is obtained from a potential divider circuit using 100V supply and 10K potentiometer
   i) Draw the circuit diagram. ii) If $R_f = 50\Omega$, $R_r = \infty$ and $V\gamma = 0$, sketch the transfer characteristic, output waveform for the given Vi. (7M+8M)

3. 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. (7M+8M)

4. Design a Schmitt trigger circuit using n-p-n silicon transistors to meet the following specifications: V_{cc}=12V, UTP=4V, LTP=2V, $h_{fe} = 60$, $I_{c2} = 3$mA. Use relevant assumptions and the empirical relationships. (15M)

5. a) 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.
   b) Design a monostable multivibrator to generate an output pulse of 250 μs duration. Assume h_{FE} (min) = 25, I_{CE} (sat) = 5 mA, $V_{CC} = 10V$ and $V_{BB} = -4V$ (7M+8M)

6. a) Draw and explain a bootstrap sweep circuit using Darlington pair. What are its merits and limitations?
   b) Discuss about the recovery time of a sweep circuit. How do you achieve short recovery time? (8M+7M)

7. a) With the help of a circuit diagram and waveforms, explain frequency division of an astable multivibrator with pulse signals.
   b) Describe synchronization with 2:1 frequency division with neat waveforms. (8M+7M)

8. a) With the help of a neat diagram, explain the working of two-diode sampling gate.
   b) Derive expressions for gain and minimum control voltages of a bi-directional two- diode sampling gate. (7M+8M)
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