

Code No: 3220401

II B. Tech II Semester Regular Examinations, April/May 2009

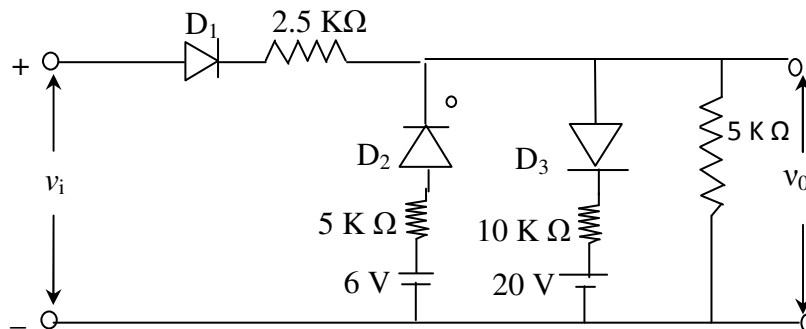
PULSE AND DIGITAL CIRCUITS
(Common to E.C.E, B.M.E, E.Con.E, I.C.E)

Time: 3 hours

Max Marks: 80

Answer Any FIVE Questions
All Questions carry equal marks

1. Derive an expression for the percentage tilt of the output of a high-pass RC circuit with large time constant excited by a symmetrical square wave with zero average value.
(b) A square wave whose peak-to-peak amplitude is 2V extends $\pm 1V$ with respect to ground. The duration of the positive section is 0.1 sec and that of the negative section 0.2 sec. If this waveform is impressed upon an RC integrating circuit whose time constant is 0.2 sec, What are the steady – state maximum and minimum values of the output waveform?
(8+8 = 16 M)
2. (a) State and prove clamping circuit theorem
(b) For the clipping circuit shown in fig. make a plot of v_0 versus v_i for the range of v_i from 0 to 50 V. indicate all slopes and voltage levels. Also, indicate for each region, the diodes which conduct.
(8+8 = 16 M)



3. (a) Explain the transistor switching-times.
(b) Design a transistor switch, with the following data. $V_{CC} = 10V$; $V_{BB} = 6V$; $I_{C\text{ sat}} = 10\text{ mA}$, $(h_{FE})_{\min} = 30$, Given NPN silicon transistor with negligible I_{CBO} . Assume junction voltages.
(8+8 = 16 M)
4. (a) The fixed-bias bistable multivibrator uses n-p-n transistors with $h_{FE} = 20$. The circuit parameters are $V_{CC} = 12V$, $V_{BB} = 3V$, $R_C = 1\text{ K}\Omega$, $R_1 = 5\text{ K}\Omega$, $R_2 = 10\text{ K}\Omega$. $V_{CE(\text{sat})} = 0.4V$ and $V_{BE(\text{sat})} = 0.8V$. Find the stable state voltages and currents.
(b) Draw the neat circuit diagram of a collector – coupled monostable multivibrator and explain its operation with the help of waveforms.
(8+8 = 16 M)
5. (a) Define sweep-speed error, the displacement error and the transmission error.
(b) Draw the circuit diagram of transistor bootstrap time base generator and explain its working with the help waveforms.
(8+8 = 16 M)

6. (a) Explain pulse synchronization and frequency division of sweep circuit.
(b) With the help of a circuit diagram and waveforms, explain frequency division by an Astable multivibrator. (8+8 = 16 M)
7. (a) Briefly explain unidirectional diode gate and write the advantages and disadvantages of this sampling gate.
(b) Draw the circuit diagram of bidirectional diode sampling gate and explain its working. Derive expressions for gain A , control voltage V_C and control voltage V_n . (8+8 = 16 M)
8. (a) Explain the characteristics of logic families.
(b) Realize NAND gate in diode – transistor logic and explain its working. (8+8 = 16 M)

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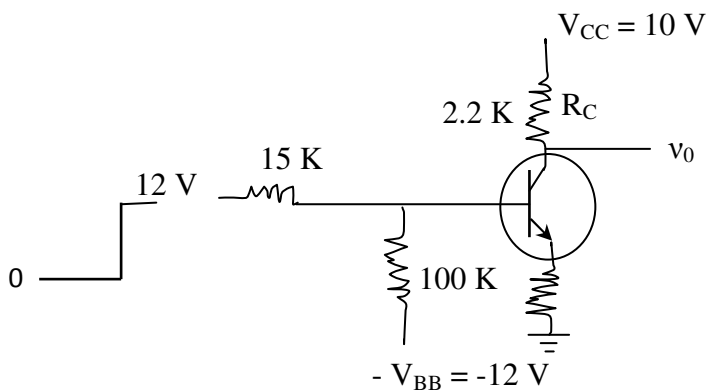
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1. (a) Derive an expression for the output of a high-pass circuit excited by an exponential input.
(b) A square-wave whose peak-to-peak value is 1 V extends ± 0.5 V with respect to ground. The duration of the positive section is 0.1 sec and of the negative section 0.2 sec. If this waveform is impressed upon an RC differentiating circuit whose time constant is 0.2 sec, what are the steady – state maximum and minimum values of the output waveform? [8+8]
2. (a) With the help of a neat circuit diagram, explain the working of a two-level diode clipper. Write the transfer characteristic equations and plot the curve.
(b) In the clamping circuit, $R_s = R_f = 50 \Omega$, $R = 20 \text{ k}\Omega$ and $C = 2 \mu\text{F}$. A Symmetrical square wave signal of amplitude 20V and frequency 5 KHz is applied at $t=0$. Draw the first three cycles of the output waveform. [8+8]
3. (a) Briefly discuss the switching times of a junction diode.
(b) Show that the circuit given below works as a switch. Assume junction voltages and $(h_{FE})_{\min} = 30$.



[8+8]

4. (a) With the help of a neat circuit diagram and waveforms explain the working of collector-coupled astable multivibrator.
(b) Design a collector-coupled monostable multivibrator with a gate width of 3ms, using n-p-n transistors and $V_{CC} = 6\text{V}$, $V_{BB} = 3\text{V}$, $I_{C \text{ sat}} = 4 \text{ mA}$, $(h_{FE})_{\min} = 40$. Assume junction voltages. [8+8]
5. (a) Define the terms slope error, displacement error and transmission error. How are they related for an exponential sweep circuit? Define the relation between them.

(b) With the help of a neat circuit diagram, explain the working of a transistor current time- base generator. [10+6]

6. (a) With the help of a circuit diagram and wave forms, explain frequency division by monostable multivibrator.

(b) Explain synchronization and frequency division of sweep circuits with symmetrical signals. [8+8]

7. (a) With the help of a neat circuit diagram, explain the working of a four-diode bidirectional sampling gate.

(b) Write the disadvantages of bidirectional two diode sampling gate.

(c) Draw the circuit diagram of bidirectional sampling gate using transistors and explain its working. [8+2+6]

8. (a) Briefly discuss different logic systems.

(b) Draw the circuit of AND gate and explain its working.

(c) Draw the circuit of NOR gate and explain its working. [4+6+6]

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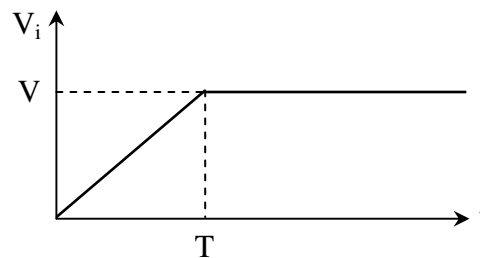
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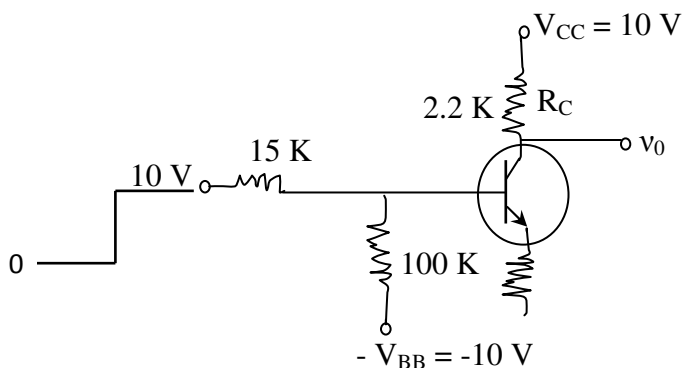
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Answer Any FIVE Questions
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1. (a) Prove that the high pass and low pass RC circuits act as differentiator and Integrator respectively.
(b) The limited ramp shown in figure is applied to an RC differentiator. Draw the output waveforms for the cases (a) $T = 0.2 RC$ (b) $T = RC$ and (c) $T = 5RC$. (8+8 = 16 M)



2. (a) With the help of neat circuit diagram and wave forms, explain the working of a transistor clipper.
(b) A symmetrical 10 K Hz square wave whose peak - to - peak excursions are ± 10 V with respect to ground is impressed on the clamping circuit. Here $R = 10 K\Omega$, $C = 1 \mu F$, the diode has $R_f = \infty$, $R_r = 0$, $V_r = 0$ and the source impedance R_s is zero. (i) Sketch the output waveform. (ii) If the diode forward resistance is $1k\Omega$, sketch the output waveform. Calculate the maximum and minimum values with aspect to ground. (iii) Repeat part (ii) if the source impedance is $1k\Omega$. (8+8 = 16 M)
3. (a) Discuss transistor as a switch.
(b) Prove that the circuit show works as a transistor switch. Assume junction voltage and $(h_{FE})_{min} = 30$. (8+8 = 16 M)



4. (a) Draw the circuit diagram of Schmitt trigger and explain its working with the help of wave forms.
(b) Design a collector coupled bistable multivibrator to meet the following specifications, $V_{CC} = V_{BB} = 12V$, $I_C (\text{sat}) = 6mA$, $h_{FE} (\text{min}) = 30$. Assume junction voltages. (8+8 = 16 M)
5. (a) Explain the basic principles of Miller and bootstrap time – base generators.
(b) With the help of a neat circuit diagram, explain the working of a simple transistor current Time –base generator. (8+8 = 16 M)
6. (a) What is phase delay? What is phase jitter? What is phase jitter? With the help of a block diagram, explain a method for achieving division without phase jitter.
(b) Describe synchronization and frequency division of a sweep circuit with symmetrical signals. (8+8 = 16 M)
7. (a) What is pedestal? Explain how the pedestal is eliminated in transistor bidirectional sampling gates.
(b) With the help a neat diagram, explain the working of a six-diode sampling gate. (8+8 = 16 M)
8. (a) Draw the circuit diagram of OR gate and explain its working.
(b) Draw the circuit diagram of NAND gate and explain its working. (8+8 = 16 M)

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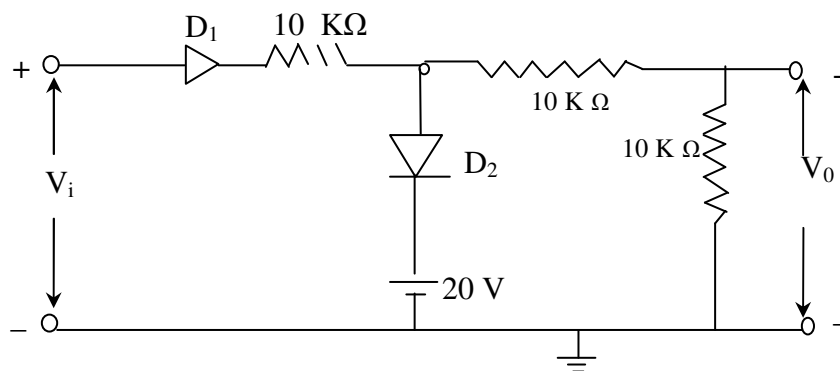
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1. (a) Why does a resistive attenuator need to be compensated? Explain different methods of compensation. What is the effect of the output resistance of the generator on an attenuator output?
(b) A square wave whose peak-to-peak amplitude is 1 V extends $\pm 0.5V$ with respect to ground. The duration of the positive section is 0.2 sec and that of the negative section is 0.3 sec. If this waveform is impressed upon an RC integrating circuit whose time constant is 0.3 sec, What are the steady-state maximum and minimum values of the output waveform? [8+8]
2. (a) For the circuit shown in fig., Plot V_o uessus V_i indicating all intercepts, slopes and voltages levels, if V_i varies linearly from 0 to 50 V.



- (b) In the clamping circuit, $R_s=100\Omega$, $R_f=50\Omega$, $R=100K\Omega$ and $C=2\mu F$. A symmetrical square wave signal of amplitude 20V and frequency 5KHz is applied at $t=0$. Draw the first three cycles of the output wave-form. [8+8]
3. (a) Write the switching times of a Transistor.
(b) Design a transistor switch with the following data: $V_{CC}=12V$, $V_{BB}=6V$; $I_{c(sat)}=10mA$; $h_{FE(min)}=40$. Assume the junction voltages. [6+10]
4. (a) A collector-coupled monostable multivibrator using n-p-n silicon transistors has the following parameters. $V_{cc}=12V$, $V_{BB}=4V$, $R_c=1k\Omega$, $R_1=R_2=R=15k\Omega$. $h_{FE}=35$, $r'_{BB}=220\Omega$ and $C=1000PF$. Neglect I_{CBO} . Calculate and plot to scale the wave shapes at each base and collector. Find the width of the output pulse.
(b) Draw the circuit diagram of Schmitt trigger and explain its working with the help of waveforms. [10+6]

5. (a) Draw the circuit diagram of transistor constant current sweep circuit and explain its working. Derive an expression for the sweep speed error.
- (b) Draw the circuit diagram of transistor miller time-base generator and explain its working. [8+8]
6. (a) Explain the pulse synchronization and frequency division in the sweep circuit.
- (b) With the help of a circuit diagram and wave-forms, explain frequency division by an astable multivibrator. [8+8]
7. (a) With the help of a circuit diagram, explain the operation of unidirectional sampling gate. Write the advantages and disadvantages of unidirectional diode sampling gate.
- (b) With the help of a neat diagram, explain the working of a two-diode bidirectional sampling gate. Derive expressions for gain, $(V_c)_{\min}$ and $(V_n)_{\min}$. [6+10]
8. (a) Discuss different logic systems.
- (b) Draw the circuit diagram of NAND gate using diode transistor logic and explain its working. [8+8]