

II B. Tech II Semester Regular Examinations, April - 2018

PULSE AND DIGITAL CIRCUITS

(Com to ECE, EIE, ECC)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answer **ALL** the question in **Part-A**

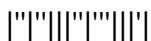
3. Answer any **FOUR** Questions from **Part-B**

PART -A

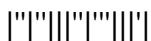
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|-------|---|----|
| 1. a) | Describe about ringing circuit? | 2M |
| b) | Draw the diode based positive clipper and draw its waveforms? | 3M |
| c) | What are the applications of time base generators? | 2M |
| d) | Draw the Schmitt trigger circuit? | 2M |
| e) | Why a monostable multivibrator is called as a delay circuit? | 3M |
| f) | Give the comparison between TTL and CMOS families? | 2M |

PART -B

- | | | |
|-------|---|----|
| 2. a) | Prove that a low pass circuit acts as an integrator. Derive an expression for the output voltage levels under steady state conditions of a low pass circuit excited by a ramp input. | 7M |
| b) | An RC low-pass filter is fed with a symmetrical square wave. The peak-to-peak amplitude of the input waveform is 10 V and its average value is zero. It is given that $RC=T/2$ where T is the period of the square wave. Determine the peak-to-peak amplitude of the output waveform. | 7M |
| 3. a) | State and prove clamping circuit theorem? And explain the Transfer characteristics of clampers. | 7M |
| b) | Give the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics | 7M |
| 4. a) | What are different types of multivibrators? Explain the stable state and quasi stable state of a multivibrator. | 7M |
| b) | Describe the sequence of events in an n-p-n transistor to change from cut-off to saturation and vice versa. How does temperature affect the saturation junction of a transistor? | 7M |
| 5. a) | Prove that an astable multivibrator works as voltage to frequency converter | 7M |
| b) | Design a Collector coupled monostable multi using npn silicon transistors has the same following parameters. $V_{CC}=12V$, $V_{BB}=3V$, $R_C=2k\Omega$, $R_1=R_2=R=20k\Omega$, $h_{FE}=30$, $r_{bb}'=200\Omega$ and $C=1000pF$, neglect I_{CB0} . (a) Calculate and plot to scale the wave shapes at each base and collector. (b) Find the width of the output pulse. | 7M |



6. a) With the help of neat circuit diagram and waveforms explain transistor miller time base generator? 6M
- b) Discuss about the recovery time of a sweep circuit. How do you achieve short recovery time? 8M
7. a) Give the comparison of different logic families? 6M
- b) Draw the circuit diagram of a unidirectional sampling gate which delivers an output only at the coincidence of a number of control voltages and explain its working. 8M



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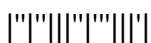
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1. a) Explain the fractional tilt of a high pass RC circuit. Write its expression? 2M
- b) State the clamping circuit theorem? 2M
- c) Define Storage time and Transition time of a diode? 3M
- d) What are commutating capacitors? Why are they required? 2M
- e) Compare the voltage and current time base generator? Give examples. 2M
- f) Differentiate between sampling gates and logic gates? 3M

PART -B

2. a) With the circuit diagram and waveforms explain the operation of RC circuits as Integrators and differentiators for a square wave input 7M
- b) Draw the different output waveforms of a RC Low Pass circuit when it is applied with Different inputs like (a) Step-voltage input (b) pulse input C) Square input? 7M
3. a) Draw the basic circuit diagram of positive clamper and negative clamper circuits and explain its operation using waveforms? 7M
- b) Compare series diode and shunt diode clippers? 7M
4. a) Distinguish between unsymmetrical and Symmetrical triggering? Why it is used? 7M
- b) Consider the Schmitt trigger with germanium transistor having $h_{fe}=20$. The circuit parameter are $V_{cc} = 15V$, $R_s = 2k\Omega$, $R_{c1}= 4k\Omega$, $R_{c2}=1 k\Omega$, $R_1= 3 k\Omega$, $R_2 = 10 k\Omega$ and $R_e= 6 k\Omega$. Calculate LTP and UTP? 7M
5. a) Explain how to draw the various waveforms and calculate their voltage levels in an emitter-coupled monostable multivibrator? 7M
- b) Design an astable multivibrator to generate a 5kHz square wave with a duty cycle of 60% and amplitude 12v. Use NPN silicon transistors having $h_{FE}(\min)= 70$, $V_{CE}(\text{sat}) = 0.3v$, $V_{BE}(\text{sat}) = 0.7v$, $V_{BE}(\text{cutoff}) = 0v$ and $RC = 2K$. Draw the waveforms seen at both collectors and bases. 7M
6. a) With the help of a neat circuit diagram and waveforms, explain the working of a transistor bootstrap time base generator? 8M
- b) List out the different methods for generating time base waveforms 6M



7. a) Draw the circuit of FOUR-DIODE sampling gate. Derive expressions for its gain (A) and V_{\min} ? 7M
- b) Draw and explain the circuit diagram of NAND , NOR gate using DTL logic 7M



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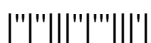
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1. a) Why sinusoidal waveforms are popular? 2M
- b) What are the disadvantages of unidirectional diode gate and two-diode gates? 3M
- c) Describe astable multivibrator? 2M
- d) Define diode forward recovery time and diode reverse recovery time? 2M
- e) What are the methods of generating a time-base waveform? 2M
- f) What do you mean by one-way and two-way clamping? 3M

PART -B

2. a) With the help of circuit diagrams, explain the working of RC and RL low-pass circuits? 7M
- b) Write short notes on: (i) RL circuits, (ii) RLC series circuits, (iii) RLC parallel circuits, and (iv) Ringing circuits 7M
3. a) With the help of a neat circuit diagram, explain the working of a two-level clipper? 7M
- b) Draw the circuit of a shunt diode positive peak clipper. Assume $R_f=50\Omega$, $V_f=0.6V$, $R_f=2M\Omega$, $R=20K\Omega$ and $V_R=+15V$. Sketch the transfer characteristics when the input voltage varies between -20V and +20V. Indicate the slopes, voltage levels $V_0(\max)$ and $V_0(\min)$ and the region where the diode conducts. Also sketch the input/output waveforms, if a sine wave of 20V peak is applied as an input. If a load resistance of $30K\Omega$ is connected across the output terminals, sketch the transfer characteristics and the output wave for a 20V peak sine wave input? 7M
4. a) Briefly explain about: (i) Diode switching and (ii) Transistor switching times 6M
- b) With the help of a neat circuit diagram, explain the working of fixed-bias binary? Draw its waveforms. 8M
5. a) Describe a monostable multivibrator and draw the neat diagram with waveforms and explain operation of the collector coupled monostable multivibrator? 7M
- b) Design the Astable Multivibrator to generate 1 KHz square wave. The supply voltage $V_{CC}=10V$, $I_{C(sat)}=10mA$, $h_{FE}=50$ and assume Si transistors. 7M
6. a) What are the general features of time base signal? Explain 6M
- b) Derive the expression for frequency of oscillations of UJT relaxation oscillator 8M



7. a) With the help of a neat diagram, explain the working of a six-diode gate? 6M
b) Draw a TTL NAND gate and explain its operation 8M



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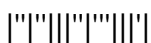
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**PART -A**

- |       |                                                                                                         |    |
|-------|---------------------------------------------------------------------------------------------------------|----|
| 1. a) | What do you mean by time constant of a circuit?                                                         | 3M |
| b)    | What is the difference between the clipping and clamping?                                               | 2M |
| c)    | Define the terms UTP and LTP?                                                                           | 2M |
| d)    | Give other names of monostable multivibrator and write any two applications of monostable multivibrator | 2M |
| e)    | Define the terms: (i) slope error, (ii) displacement error and (iii) transmission error?                | 2M |
| f)    | What are the merits and demerits of TTL logic?                                                          | 3M |

**PART -B**

- |       |                                                                                                                                                                                                                                                           |    |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2. a) | Describe the relationship between rise time and RC time constant of a low pass RC circuit?                                                                                                                                                                | 7M |
| b)    | Explain the response of RC High Pass circuit for the following input waveforms A) Step B) Pulse                                                                                                                                                           | 7M |
| 3. a) | Give the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics?                                                                                                                       | 6M |
| b)    | Describe what is clamping operation? State and prove the clamping circuit theorem?                                                                                                                                                                        | 8M |
| 4. a) | Discuss about the design of Transistor as a switch?                                                                                                                                                                                                       | 7M |
| b)    | Design collector coupled fixed-bias Bistable Multivibrator to operate from $\pm 6V$ supply. Given $I_C(\text{sat}) = 1\text{mA}$ , $h_{FE} = 35$ . Assume Si transistor.                                                                                  | 7M |
| 5. a) | Explain with the help of neat circuit diagram the principle of operation of monostable multivibrator, and derive an expression for pulse width?                                                                                                           | 7M |
| b)    | Design a collector coupled astable multivibrator to meet the following Specifications: $f=10\text{KHZ}$ , $V_{CC}=12V$ , $I_C(\text{sat})=4\text{mA}$ and $h_{FE}(\text{min})=20$ . Assume that $V_{CE}(\text{sat})=0.3V$ and $V_{BE}(\text{sat})=0.7V$ . | 7M |
| 6. a) | List out applications of voltage time base generator                                                                                                                                                                                                      | 6M |
| b)    | Compare the voltage and current time base generator? Give examples and explain the basic principles of miller and bootstrap time-base generators?                                                                                                         | 8M |



7. a) With the help of a neat diagram, explain the working of a Bidirectional gates using transistors? 7M
- b) Describe ECL logic? With the help of a neat diagram, explain the working of a two-input ECL OR/NOR gate? 7M

