INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNIACTION ENGINEERING

QUESTION BANK

Course Name	:	**PULSE AND DIGITAL CIRCUITS**
Course Code	:	A40415
Class	:	II - B. Tech
Branch	:	ECE
Year	:	2016-17
Course Coordinator	:	Mr. B.Naresh
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OBJECTIVES

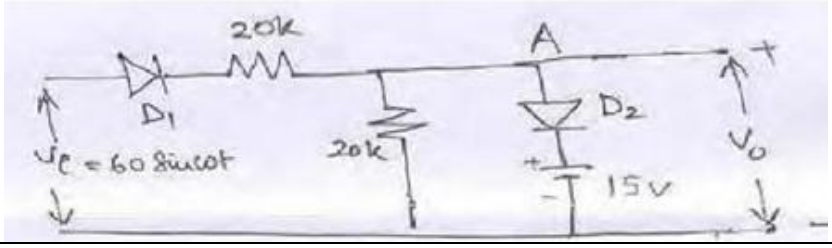
To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

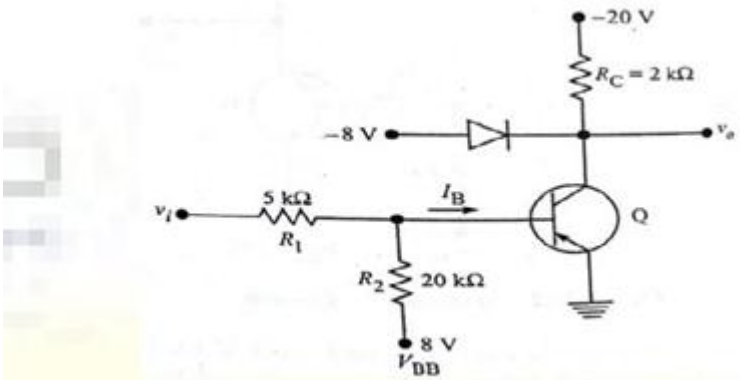
S.No	QUESTION	Blooms taxonomy level	Course Outcome
	UNIT-I **LINEAR WAVE SHAPING** **SHORT ANSWER QUESTIONS**		
1	Name the signals which are commonly used in pulse circuits and define any five of them?	Remember	1
2	Define linear wave shaping?	Remember	1
3	Define attenuator and types of attenuator?	Remember	3
4	Explain the fractional tilt of a high pass RC circuit. Write the Expression?	Understand	1
5	State the lower 3-db frequency of high-pass circuit?	Remember	1
6	Distinguish between the linear and non-linear wave shaping circuits.	Remember	1
7	Justify the reason for double differentiation circuit as rate-of-rise amplifier.	Evaluate	1
8	Show that a high pass circuit with a small time constant acts as differentiator?	Understand	1
9	Define Rise time? Give the relations between rise time and bandwidth?	Remember	1
10	Show that a low pass circuit with a time constant acts as Integrator?	Understand	2
11	Name a wave shaping circuit which produces a Ramp wave as an output by taking a step signal as input and draw its output for a sinusoidal wave.	Remember	2
12	List the expressions for the output of a low pass circuit by a step and symmetrical square waves?	Analyze	2
13	Solve 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.	Apply	2
14	Explain the response of a high pass RC circuit to a step input signal?	Understand	1
15	Name a wave shaping circuit which produces a Ramp wave as an output by taking a step signal as input and draw its output for a sinusoidal wave	Remember	1
16	List the expressions for the output of a low pass circuit by a step and symmetrical square waves?	Analyze	2
17	Define peaking Circuit? Write the drawbacks of RL linear wave shaping	Remember	1

	circuit compared to RC circuit?		
18	List out the reasons for preferring integrators over differentiators in Analog computer applications?	Remember	1
19	a) List the expression for gain and phase when sinusoidal signal is passed through RC Low pass circuit. b) Define Percentage Tilt and Rise time?	Remember	2
	LONG ANSWER QUESTIONS		
1	Explain the response of RC High Pass circuit for the following input waveforms A) Step B) Pulse	Understand	1
2	Evaluate the expression for a %tilt of a square wave after passing through a high pass RC Circuit. **(or)** A symmetrical square wave of peak -to-peak amplitude `V' and frequency `f' is applied to a high pass circuit. Show that the percentage tilt is given by P = 1- e(-1/2RC) /1+e(-1/2RC) *100%:	Evaluate	1
3	Explain the operation of RC circuits as Integrators and differentiators for a square wave input With the circuit diagram and waveforms	Understand	1,2
4	Explain the response of RC low pass circuit for exponential input signal	Understand	2
5	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.	Evaluate	1
6	Explain the response of RL circuit when a step input signal is applied?	Understand	1,2
7	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	Remember	3
8	Compare the relationship between rise time and RC time constant of a low pass RC circuit.	Analyze	2
9	When does an RLC circuit function as a ringing circuit? What is the relationship between Quality factor Q and the number of cycles N in the response of this circuit?	Remember	1
10	Explain double differentiator with the help of neat sketches	Understand	1
	ANALYTICAL QUESTIONS		
1	Design a step input of 10V when applied to the Low Pass RC circuit produces the output with a Rise time of 200 micro sec. Calculate the upper 3dB frequency of the circuit if the circuit uses a capacitor of 0.47μF, **Determine** the value of the resistance.	Evaluate	2
2	A pulse of 5 V amplitude and pulse width of 0.5m sec is applied to a high pass RC circuit consisting of R=22 K ohms and C= 0.47 micro F. Sketch the output waveform and determine the percentage tilt in the output.	Evaluate	1
3	Construct an RC differentiator circuit for pulses of 1ms repletion and 10V amplitude. The trigger pulses are to have 8V amplitude. The source resistance is 50ohmand load resistance is 500ohm.	Create	1
4	A 1KHz square wave output from an amplifier has rise time tr = 250 ns and tilt = 10%, determine the upper and lower frequencies.	Evaluate	1
5	A 10Hz square wave is fed to an amplifier. Find and sketch the output wave forms under following conditions. The lower 3db frequency is The lower 3db frequency is i. 0.3Hz ii. 3Hz iii. 30Hz	Remember	1
6	A symmetrical square wave whose peak-to-peak amplitude is 2V and whose average value is zero is applied to on RC integrating circuit. The time constant is equals to half -period of the square wave. Find the peak to peak value of the output amplitude.	Remember	2
7	A symmetrical square wave is applied to a HP circuit having R = 20 k and C = 0.05 μ f. If the frequency of input signal is 1kHz and the signal swings between +0.5V to -0.5V , illustrate the output wave shape and indicate the voltages, also explain what happens if the input signal frequency is reduced to 100 Hz?	Understand	1
8	An oscilloscope displays a 5Hz square wave with 6% tilt. The signal input has no tilt and is The signal input has no tilt and is coupled to the oscilloscope via a 4.7μF capacitor. Calculate the input resistance of the oscilloscope.	Analyze	1
9	The limited ramp is applied to an RC differentiates. Illustrate the output waveform for the case (i)T=RC (ii) T=0.2RC (iii)T=5RC.	Understand	1

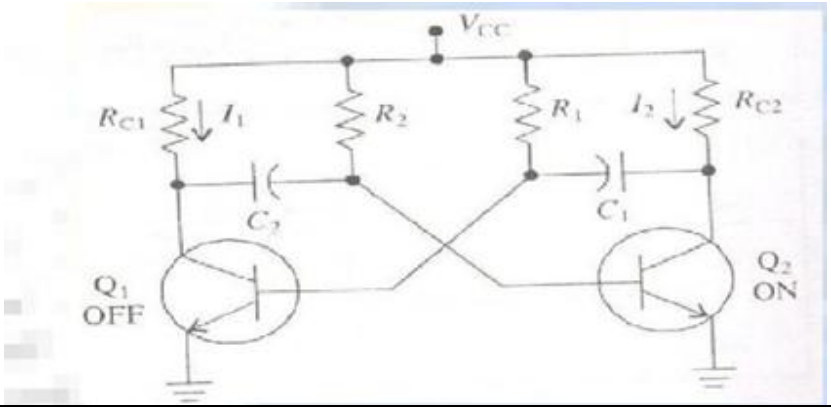
10	Assuming the capacitor to be initially unchanged, determine the output response of the low pass RC circuit with time constant 0.05ms to the input waveform shown in fig given below	Evaluate	2
	UNIT -2 **NON LINEAR WAVE SHAPING** **SHORT ANSWER QUESTIONS**		
1	Define non-linear wave shaping? List out the names of nonlinear wave shaping?	Remember	4
2	Distinguish between the comparator and clipping circuit?	Analyze	4
3	Justify that a clamping circuit is a dc inserter	Evaluate	6
4	What is the definition of clamping circuit theorem	Remember	6
5	What is the relationship between R and the forward resistance R_f and reverse resistance R_r of the Clipping Circuit	Remember	4
6	Define Series clipper and shunt clipper.	Remember	4
7	What is the meaning of transmission region and attenuation region of a Clipping Circuit?	Remember	4
8	List out the two regions of operation of a transistor that are used in a transistor Clipping Circuit.	Remember	4
9	Justify that a clamping Circuit is a Non-linear Wave Shaping Circuit?	Evaluate	6
10	Define Series Noise Clipper and Shunt Noise Clipper?	Remember	4
11	List the applications of Clamping Circuit	Analyze	5
12	Design the circuit diagram of Slicer? Explain its Operation	Create	4
13	List the other names that are used for describing the clipping Operation?	Remember	4
14	Name few applications of clipping and clamping circuits.	Remember	4,5
15	List the applications of comparator.	Understand	6
16	Define the terms of Breakpoint and Transfer Characteristics?	Remember	4
	LONG ANSWER QUESTIONS		
1	Prove the clamping circuit theorem	Evaluate	6
2	List the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics.	Remember	4
3	Explain positive peak clipping without reference voltage.	Understand	4
4	Explain about positive peak voltage limiters above reference level.	Understand	4
5	Design the basic circuit diagram of positive peak clamper circuit and explain its operation.	Create	4
6	Design the basic circuit diagram of a DC restorer circuit and explain its operation. Sketch the output wave form for a sinusoidal input.	Create	5
7	Explain the response of the clamping circuit when a square wave input is applied under steady state conditions.	Understand	5
8	What are the effects of diode characteristics on clamping voltage.	Remember	5
9	List the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics.	Remember	4
10	Design the circuit diagram of an emitter-coupled clipping circuit and draw its transfer characteristic indicating all intercepts, slopes and voltage levels.	Create	4
11	Compare series diode clipper and shunt diode clipper.	Evaluate	4
12	What is synchronized clamping? Explain.	Remember	5
13	Analyze the diode comparator circuit. Draw the response of the circuit to a ramp input Vi=lt.	Analyze	6
14	Explain the working of Transistor Clipper with the help of neat Circuit diagram	Understand	4
15	Explain in brief about Practical Clamping?	Understand	5
16	Explain the response of the clamping circuit when a square wave input is applied under steady state conditions.	Understand	5
17	Design the diode shunt clipper that clips the sine wave signal above +5V and below -5V.	Create	5
	ANALYTICAL QUESTIONS		
1	A 100V peak square wave with an average value of 0V and a period of 20 ms is to be negatively clamped at 25V. illustrate the circuit diagram	Understand	4

	necessary for this purpose. A lso, draw the input and output waveforms.		
2	The input voltage V to the tw o-level clipper shown in fig2. Varies linearly from 0 to 200V.Illustrate the o/p Voltage Vo to the same scale as the i/p voltage	Evaluate	5
3	Design the value of Resistance R in clipper circuit when forward Resistance of diode is 10kohms and reverse resistance of diode is 100k ohms.	Create	4
4	Design the circuit of a shunt diode positive peak clipper. Assume Rf=50Ω, V_γ=0.6V,Rr=2MΩ, R=20KΩ and VR=+15V. Sketch the transfer characteristics when the input voltage varies between -20V and +20V. Indicate the slopes, voltage levels V0 (max) and Vo (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 30KΩ is connected across the output terminals, sketch the transfer characteristics and the output wave for a 20V peak sine wave input?	Create	4
5	For the clipper circuit shown in figure, the input vi = vi = 60 sin ωt. Find and plot to Scale i. The transfer characteristic indicating slopes and intercepts. ii. Input / output on the same scale. Assume ideal diodes. 	Remember	4
6	Design a diode clamper circuit to clamp the positive peaks of the input signal at zero level. The frequency of the input signal is 500 Hz?	Create	5
7	A 100V peak square wave with an average value of 0V is to be negatively Clamped at 25V. Illustrate the output waveforms?	Understand	5
	UNIT-3 **STEADY STATE SWITCHING CHARACTERISTICS OF A DEVICES & SAMPLING GATES** **SHORT ANSWER QUESTIONS**		
1	Name the devices that can be used as switches.	Remember	7
2	Name the three regions of operation of a transistors.	Remember	7
3	How are the junctions of a transistor biased for cut off region operation.	Remember	7
4	How are the junctions of transistor biased for active region operation.	Remember	7
5	How are the junctions of transistor biased for saturation region operation	Remember	7
6	When a transistor does acts as a closed switch.	Remember	7
7	When a transistor does acts as a open switch	Remember	7
8	Which current flows through the diode when it is in steady state condition.	Remember	7
9	Define rise time in a transistor	Understand	7
10	Define storage time in a transistor	Understand	7
11	Define delay time in a transistor	Understand	7
12	Tell transistor is a voltage controlled or current control device	Remember	7
13	When transistor acts as an amplifier	Remember	7
14	Define an ideal diode	Understand	7
15	Define Forward recovery time	Understand	7
16	Define reverse recovery time	Understand	7
17	Define Transition time of a diode	Understand	7
18	Plot the Practical diode V-I characteristics	Analyze	7
19	List the Expressions for the Static resistance of a diode	Analyze	7
20	List the Expressions for the dynamic resistance of a diode	Analyze	7
21	How the h_{fe} of a transistor varies with temperature	Remember	7
22	What are the cut-in voltages of germanium and silicon	Remember	7
23	Explain the diode current equation	Understand	7
24	What are the non linearity's occur in transistors	Remember	7
25	Define Ton time for a transistor	Understand	7

26	Define Toff time for a transistor	Understand	7
27	Plot the piece-wise linear diode V-I characteristics	Understand	7
28	Define current gain of a transistor	Understand	7
MID-II			
1	Define Sampling gate?	Remember	8
2	What are the other names for sampling gate?	Remember	8
3	Compare the difference between sampling gate & logic gate?	Understand	8
4	How many types of sampling gates are there?	Remember	8
5	List the names of sampling gates?	Analyze	8
6	Define Uni directional sampling gate?	Remember	8
7	Define Bi directional sampling gate?	Remember	8
8	What is the meaning of gating signal?	Remember	8
9	What are the other names of gating signal?	Remember	8
10	What is a chopper often called?	Remember	9
11	What for Chopper amplifier is used?	Remember	9
12	List the applications of sampling gates?	Analyze	9
13	Define Gain of gate?	Remember	8
14	List the drawbacks of Two- diode sampling gate?	Analyze	8
15	Define pedestal?	Remember	8
16	What are the disadvantages of uni directional sampling gate?	Remember	8
17	What are the main blocks in Chopper amplifier?	Remember	9
18	What does the display consists of in a sampling scope?	Remember	9
19	List the advantages of unidirectional sampling gate?	Analyze	8
20	Compare two diode and four diode sampling gate?	Understand	8
21	Show the circuit for uni directional sampling gate?	Understand	8
22	What is the advantage of shunt over series switch?	Remember	8
23	How to overcome pedestal in uni directional sampling gates?	Remember	8
24	Show the circuit for unidirectional sampling gate?	Understand	8
LONG ANSWER QUESTIONS			
1	Explain the storage and transition times of the diode as a switch.	Understand	7
2	Demonstrate the switching times of BJT by considering charge distribution across the base region. Explain this for cut-off, active and saturation region..	Understand	7
3	Define different Switching times of a transistor with suitable collector current versus time characteristics	Remember	7
4	Explain the temperature sensitivity parameters of a transistor	Understand	7
5	Explain the saturation parameters of a transistor	Understand	7
6	Illustrate the principle of sampling gates with series and parallel switches and compare them.	Understand	8
7	Explain how a transistor can be used as a switch. (b) Explain the phenomenon of 'Latching" in a transistor switch	Understand	7
8	Explain the operation of Four diode Alternative form bidirectional Sampling gate	Understand	8
9	Find the expressions for gain and minimum control voltages of a bidirectional two- diode sampling gate ?	Remember	8
10	Illustrate with neat circuit diagram, the operation of unidirectional sampling gate for multiple inputs.	Understand	8
11	a) Why the sampling gates are called linear gates? (b) Compare the unidirectional and bi-directional sampling gates.	Remember	8
12	Explain the effect of control voltage on gate output of unidirectional sampling gate using diode with some example.	Understand	8
13	Explain the basic principles of sampling gates using series switch and also give the applications of sampling gate.	Understand	7
14	Design the circuit of two-diode bi-directional sampling gate. Explain its operation & derive expressions for gain and minimum control voltage in the circuit.	Create	8
15	Explain the operation of chopper Amplifier and Sampling Scope.	Understand	9

16	Design the circuit of FOUR-DIODE sampling gate. Derive expressions for its gain (A) and Vmin.	Create	8
	ANALYTICAL QUESTIONS		
1	Design a high speed common emitter transistor switch operating with two power supplies Vcc=12V and –VBB= -10V. the transistor is expected to operate at Ic= 8mA, IB= 0.75mA.The static current gain hFE of the transistor is 30, VBE(sat) = 0.3V, and R2=3R1.Determine the values of the three resistors Rc, R1 ,R2.	Evaluate	7
2	Find the output levels of the circuit shown in fig. for the inputs of 0V & -8v and verify that the circuit is an inverter. What is the minimum value of h_{FE} required .Neglect the junction Saturation voltages and assume an ideal diode. 	Remember	7
3	The forward voltage across diode is 0.4 V and forward current through it is 10nA at temperature 27 degree Celsius. For forward voltage of 42V the current through diode becomes twice. Determine the value of I_o.	Evaluate	7
4	Design a high speed common emitter transistor switch operating with two power supplies Vcc=12V and $–V_{BB}$= -10V. the transistor is expected to operate at Ic= 8mA, I_B=0.75mA.The static current gain h_{FE} of the transistor is 30, $_{VBE(sat)}$ = 0.3V, and $R_2=3R_1$.Determine the values of the three resistors Rc, R_1 ,R_2.	Create	7
5	Design the Transistor switch (Inverter) for the following specifications Vin= ±3Vsquare wave, VCC=10V, IC=1mA, hFE=50.Assume Si transistor?	Create	7
6	Design a transistor inverter circuit (NOT gate) with the following specifications: VCC = VBB = 10V,ICsat = 10mA; hfemin = 30; the input is varying between 0 and 10V. Assume typical junction voltages of npn silicon transistor	Create	7
7	Assume Vs = 20V, Rf = 25Ω, RL = Rc = 100KΩ. Find i) Gain (A) ii) Minimum positive control voltage (VCP)min iii) Minimum negative control voltage (Vcn)min for four diode sampling gate?	Remember	8
8	Determine the gain A, minimum values Vmin and Vn(min) applicable to the four diode bi-directional sampling gate. The signal amplitude Vs=24v and assume that Rz=2.7k, RL=RC=120K, and the forward resistance of all the diodes Rf is assumed to be 25. If the biasing voltage on either side of this circuit full the condition V=Vmin. Determine the minimum value(Vc)min	Evaluate	8
	UNIT-IV **MULTIVIBRATORS & TIME BASE GENERATORS** **SHORT ANSWER QUESTIONS**		
1	Define Multivibrator? Point out the different types of Multivibrator?	Remember	10
2	Distinguish between Stable state and a Quasi Stable state in a Multivibrator?	Analyze	10
3	List the other names for describing the Bistable Multivibrator?	Remember	10
4	Define Settling time, transition time in a Bistable Multivibrator.	Remember	10
5	Justify to state that the resolving time is the sum of the transition time and the settling time.	Evaluate	10
6	Discuss the different methods of Triggering or flip-flop?	Create	10

7	Explain the role of Commutating Capacitors?	Evaluate	10
8	Is Bistable multi a flip-flop, justify	Evaluate	10
9	Compare the difference between Symmetrical and unsymmetrical triggering	Analyze	10
10	circuit in Bistable.		
11	How the effect of loading over come in Bistable Multivibrator.	Remember	10
12	List the Expression for Maximum frequency of Bistable Multivibrator?	Remember	10
13	List the other names for the monostable Multivibrator?	Remember	10
14	Classify the Multivibrator based on coupling elements used to generate	Analyze	10
15	regenerative feedback?		
16	Name any two methods to eliminate the Hysteresis in Schmitt Trigger?	Remember	10
17	List the expression of pulse time in Monostable Multivibrator?	Remember	10
18	Define terms UTP and LTP?	Remember	10
19	Compare the voltage and current time base generator? Give examples	Understand	11
20	Define the term Recovery Time for Astable Multivibrator?	Remember	10
21	List the expression of frequency of Oscillations in Astable Multi	Analyze	10
22	Show that an Astable Multivibrator is also called square Wave generator .	Remember	10
23	Which amplifier is used in miller time base generator?	Remember	11
24	What are commutating capacitors? Why are they required?	Remember	10
25	What is the best method of triggering a binary asymmetrically?	Remember	10
26	Name the circuit whose output is a signal with a duty cycle of 50% for a input signal which is an output of oscillator.	Remember	10
27	Why is monostable multivibrator also called a delay circuit?	Remember	10
28	Which device can be used as a switch in sweep circuits? Write the expression for sweep time of sweep circuit with above device.	Remember	10
29	List the Expression for Sweep speed in the exponential charging of a capacitor.	Remember	11
	LONG ANSWER QUESTIONS		
1	a)Explain the operation of bistable multivibrator circuit with circuit diagram and waveform b) Why collector catching diodes are used in multi vibrators?	Understand	10
2	Explain how a compensation circuit improves the linearity of a Bootstrap voltage time base generator.	Understand	11
3	Explain with the help of neat circuit diagram the principle of operation of monostable multivibrator, and derive an expression for pulse width. Draw the wave forms at collector and Bases of both transistors? What is monostable multivibrator?	Understand	10
4	Design the various wave shapes of the astable multi vibrator.	Create	10
5	Explain the basic principles of Miller and Bootstrap time base generators.	Understand	11
6	Define the terms slope error, displacement error and transmission error of time-base signal.	Remember	11
7	Explain the working of a transistor Miller time base generator. With the help of a neat circuit diagram and waveforms	Understand	11
8	Explain how to draw the various waveforms and calculate their volatage levels in an emitter-coupled monostable multi.	Understand	10
9	Solve an expression for slope error (es) for an exponential sweep results when a capacitor is charged from a supply voltageV through a resistor R. If the peak sweep voltage is Vs	Apply	11
10	Design the circuit of a linear current sweep and explain its operation with waveforms. Explain the necessity of generating trapezoidal waveform.	Create	11
11	Explain the operation of Fixed-Bias Bistable multivibrator with circuit diagram and waveforms.	Understand	10
12	Explain the working of a Self bias Bistable multivibrator circuit with the help of waveforms and circuit diagram.	Understand	10
13	Distinguish between unsymmetrical and Symmetrical triggering? Why it is used?	Analyze	10
14	Explain different triggering methods of binary circuits.	Understand	10
15	Explain how Schmitt trigger circuit act as a switch.	Understand	10

16	Design and clearly indicate the restoration time and fly back time on the typical waveform of a time base voltage. Solve the relation between the slope, transmission and displacement errors	Create	10
17	Define sweep speed error, transmission error and displacement error pertaining to sweep circuits. Also derive the expressions for the same with respect to an exponential sweep circuit. How are linearly varying current waveforms generated?	Remember	10
18	Explain the working of transistor Bootstrap time base generator with the help of neat diagram	Evaluate	11
19	Compare the voltage and current time base generators?	Understand	11
20	Explain the transistor Miller time base generator with the help of circuit diagram?	Evaluate	11
21	Find the expression for gate width of a Monostable Multivibrator neglecting the reverse saturation current ICBO?	Remember	10
22	Explain the working of a collector coupled Astable Multivibrator? Obtain the expression for frequency in Astable Multivibrator With the help of neat circuit diagram and waveforms	Evaluate	10
23	Explain the operation of Astable multivibrator	Evaluate	10
	ANALYTICAL QUESTIONS		
1	Design a Schmitt trigger circuit using NPN transistors having hFE(MIN) =60 . VBE cut-off = 0V, VCE(Sat) = 0.2V and VBE(Sat) = 0.7V. Given Vcc=8V and o/p swing = 6V, UTP = 3.5V, LTP = 1.5V, R1 = 10K AND R2 = 2K.Determine Rc1, Rc2 and Re?	Create	10
2	Design a transistor bootstrap ramp generator to provide an output amplitude of 12V over a time period of 2ms. The input signal is a negative going pulse with an amplitude of 5 V, a pulse width of 2ms and the time interval between pulses is 0.5ms. The load resistance is 1K and the ramp is to be linear within 1%. The supply is to be 15V. take hfe(min) = 80.	Create	11
3	A collector coupled Fixed b ias binary uses NPN transistors with hFE = 100. The circuit parameters are VCC = 12v, VBB = -3v,RC = 1k , R1 = 5k , and R2 = 10 k . Verify that when one transistor is cut-off the other is in saturation. Find the stable state currents and voltages for the circuit. Assume for transistors VCE(sat) = 0.3V and VBE(sat) = 0.7V.	Remember	10
4	Design a Schmitt trigger circuit using n-p-n silicon transistors to meet the following specifications: Vcc=12v, UTP=4v, LTP=2v,hfe=60, Ic2=3mA. Use relevant assumptions and the empirical relationships.	Create	10
5	Design a collector coupled astable multivibrator to meet the following Specifications: f =10KH Z,V*CC* =12V,I *C* (sat)=4mAand h_{FE} (min)=20.Assume that V *CE* (sat)=0.3V and V *BE* (sat)=0.7V.	Create	10
6	Design an astable multivibrator to generate 5kHz square wave with a duty cycle of 40% and if amplitude 12V. Use NPN transistor having hFE = 100, VBesat = 0.7V , VCEsat = 0.2, ICmax = 100mA. Show the waveforms seen at both the collector and bases. 	Create	10
7	Design an astable multi for an o/p amplitude of 15V and square wave	Create	10

	frequency of 500Hz. Assum e hFEmin = 50, ICsat = 5mAand VCEsat = 0.		
8	Find the component values of a bootstrap sweep generator, given Vcc=18V, Ic(sat) = 2mA an d hfe(min)=30.	Remember	11
9	A transistor bootstrap ramp generator is to produce a 15V, 5ms output to a 2kohms load resistor. The ramp is to be linear within2%. Design a suitable circuit using Vcc = 22V, −VEE = -22V and transistor with hfe(min) = 25. The input p ulse has an amplitude of -5V, pulse width = 5ms and space width = 2.5 ms.	Create	11
10	Silicon transistors with h fe = 30 are available. If Vcc = 12V and V_{BB}= 6V, design a fixed bias bistable multivibrator.	Create	11
11	Consider the Schmitt trigger with germanium transistor having hfe= 20. The circuit parameter ar e Vcc = 15V, Rs = 2kΩ, Rc1= 4kΩ, R1= 1 kΩ= 3 kΩ R2 = 10 kΩ and Re= 6 kΩ.Find LTP and UTP.	Remember	11
12	Design an astable multivibrator to generate a 5kHz square wave with a duty cycle of 60% and amplitude 12v. Use NPN silicon transistors having hFE(min)= 70, VCE(sat) = 0.3v, VBE(sat) = 0.7v, VBE(cutoff) = 0v and RC = 2K. Draw the waveforms seen at both collectors and bases.	Create	10
13	Design a Fixed Bias binary by given fallowing specifications, Vcc=Vbb=12V, hfe(min) = 20,Ic(sat)=4mA Assume npn si-Transistors	Create	10
14	Design a Self Bias binary using si transistors. Vcc=6V, hfe(min) =30,Assume appropriate junction voltages for your design?	Create	10
15	The normal self-biased binary uses npn si transistors having worst-case values of Vce(sat)=0.4V, Vbe(sat)=0.8V and zero base to emitter voltage for cutoff. The circuit parameters are Vcc =20V,Rc1=Rc2=4.7kΩ, R1=30 kΩ,R2=15kΩ and Re=390 kΩ a) Find Stable state Currents and Voltages. b) Find the minimum value of hfe required to give the values of part(a) c) As the temperature is increased, what is the maximum value to which Icbo can increase before the condition is reached where neither transistor is OFF.	Remember	10
UNIT-V **SYNCHRONIZATION AND FREQUENCY DIVISION & LOGIC FAMILIES** **SHORT ANSWER QUESTIONS**			
1	Define Relaxation circuit? Give Some examples.	Remember	14
2	Define Synchronization? List the different types of Synchronization?	Remember	13
3	Name some negative resistance devices used as relaxation Oscillator?	Remember	14
4	Define the terms Sweep time and Restoration time?	Remember	14
5	Define phase delay and phase jitter?	Remember	13
6	Distinguish between Synchronization and synchronization with frequency division.	Analyze	13
7	Compare Sine wave synchronization with pulse synchronization	Evaluate	13
8	Illustrate the condition to be met for pulse synchronization	Understand	13
9	Discuss the classification of logic families	Create	15
10	What are the classifications of saturated bipolar logic families	Remember	15
11	Define Fan-out,Fan in, Propagation delay and Power dissipation?	Remember	15
12	Name the three types of TTL gate	Understand	15
13	Design the waveform at the base of the monostable relaxation circuit to show the frequency division.	Create	14
14	List out the advantages and disadvantages of totem pole configuration.	Remember	15
15	Compare merits and demerits of ECL?	Evaluate	15
16	Discuss any two characteristics of ECL gates?	Create	15
17	Identify the logic family for simple and Most complex fabrication?	Apply	15
18	Design the circuit diagram of diode resistor logic AND gate?	Create	15
LONG ANSWER QUESTIONS			
1	Explain the three input OR gate and explain its operation.	Evaluate	15
2	Compare the advantages and disadvantages of transistor and diode logic.	Understand	15
3	Explain the operation of TTL NAND gate with circuit diagram?	Evaluate	15
4	Construct a three input AND gate and verify its truth table using diodes &	Apply	15

	resistors.		
5	Explain the working of Inverter using circuit diagram?	Understand	15
6	Explain the operation of diode - resistor logic AND & OR gate using circuit diagram	Understand	15
7	What do you mean by a relaxation circuit? Give a few examples of relaxation circuits.	Understand	
8	Explain sine wave frequency division using a sweep circuit with the help of neat waveforms	Evaluate	13
9	Explain the principle of synchronization" and `synchronization with frequency division.	Understand	13
10	Explain the method of pulse synchronization of relaxation devices, with examples.	Understand	13
11	Explain the frequency division in monostable multivibrator with the help of circuit diagram & waveforms?	Evaluate	13
12	Define the terms phase delay and phase jitter. What is the condition to be met for pulse synchronization?	Remember	13
13	Compare TTL and RTL logic and Draw the Transistor logic NAND gate and explain its operation.	Understand	
14	Build the circuit diagram of NAND , NOR gate using DTL logic and explain its working.	Apply	15
15	Explain frequency division of an Astable multivibrator using pulse signals With the help of a circuit diagram and waveforms.	Understand	13
	ANALYTICAL QUESTIONS		
1	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, Ip=2_A, Iv=1nA and V_{EBSAT}=3V.	Create	14
2	In the UJT sweep circuit, VBB = 20V, Vyy = 50V, R=5k, C=0.01µF UJT has _η= 0.5.Find i. amplitude of sweep signal ii. Slope and displacement errors and iii. Estimated recovery time.	Remember	14
3	The relaxation oscillator when running freely generates output sweep amplitude of 100V and frequency 1kHz. Synchronizing pulses are applied such that at each pulse the breakdown voltage is lowered by 20V. Over what frequency range the synchronizing pulse frequency may be varied if 1:1 synchronization is to result?	Apply	14
4	Design a transistor inverter circuit (NOT gate) with the following specifications: VCC = VBB = 10V, I_{Csat} = 10mA, h_{femin} = 30. The input is varying between 0 and 10V. Assume typical junction voltages of npn silicon transistor	Create	15
5	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 asmall 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.	Remember	14
6	A UJT sweep operates with Vv = 3V, Vp=16V and _η=0.5. A sinusoidal synchronizing voltage of 2V peak is applied between bases and the natural frequency of the sweep is 1kHz, over what range of sync signal frequency will the sweep remain in 1:1 synchronism with the sync signal?	Remember	14
7	The transistor inverter (NOT gate) circuit has h_{femin} = 40, Vcc = 12V, Rc =2.2k, R1 = 15k and R2 = 100k, VBB = 12V. The input is varying between 12V and 0V. Assume typical junction voltages of pnp transistor. How this circuit works as NOT gate.	Remember	14

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