COURSE CODE: 23EC0459

R23

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583
QUESTION BANK (DESCRIPTIVE)

Subject with Code: Analog Circuits (23EC0406)

Course & Branch: B.Tech.–EEE

Regulation: R23 **Year & Sem:** II-B.Tech.& II-Sem.

UNIT –I
DIODE CLIPPING AND CLAMPING CIRCUITS

1.	a)	Define clipper and list types.	[L1][CO1]	[2M]
	b)	List the applications of clampers.	[L1][CO1]	[2M]
	c)	Discuss the need of biasing of a transistor.	[L2][CO1]	[2M]
	d)	Define operating point.	[L1][CO1]	[2M]
	e)	What is thermal Runaway?	[L1][CO1]	[2M]
2.	a)	Explain positive and negative clippers with neat sketches	[L2][CO1]	[5M]
	b)	Explain about positive biased clippers with neat sketches	[L2][CO1]	[5M]
3.	a)	Describe the operation of clipping at two independent levels	[L2][CO1]	[5M]
	b)	Draw the transfer characteristics of clippers and explain.	[L2][CO1]	[5M]
4.	a)	Draw the circuit diagram of positive clamper and input & output wave forms.	[L2][CO1]	[5M]
	b)	Describe the operation of negative clamper circuit with neat diagram	[L2][CO1]	[5M]
5.		Describe the operation of Biased Positive Clipper circuit with neat diagram	[L2][CO1]	[10M]
6.	a)	Comparison between clipping and clamping circuits.	[L2][CO1]	[4M]
	b)	List out the different types of clipping and clamping circuits.	[L1][CO1]	[6M]
7.	a)	Explain the concept of DC and AC Load lines and discuss the Criteria for fixing the Q-point.	[L2][CO2]	[5M]
	b)	Draw the Fixed bias circuit and derive an expression for the stability factor.	[L2][CO2]	[5M]
8.	a)	Compare the various biasing techniques of a BJT.	[L2][CO2]	[4M]
	b)	Draw the self-bias circuit and derive an expression for the stability factor.	[L4][CO2]	[6M]
9		Consider the self-bias circuit where Vcc = 22.5 volts, Rc =5.6kΩ, R_2 = 10kΩ and R_1 = 90kΩ, hfe = 55, V_{BE} =0.6V. the transistor operates in active region. Determine i) Operating point ii) stability factor.	[L3][CO6]	[10M]
10.	a)	Draw the collector to base bias circuit and derive an expression for the stability factor.	[L4][CO3]	[6M]
	b)	Why self-bias is more stable compared with other biasing methods.	[L2][CO2]	[4M]
11.		Explain Thermistor & Sensistor compensation techniques with circuit diagram.	[L2][CO2]	[10M]

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UNIT –II
Small signals modeling of BJT and Feedback amplifier

1.	a)	List out four hybrid parameters	[L1][CO2]	[2M]
	b)	Sketch the Equivalent circuit of a transistor using h-Parameters.	[L1][CO2]	[2M]
	c)	Express the negative feedback amplifier.	[L1][CO2]	[2M]
	d)	List the characteristics of negative feedback amplifiers.	[L1][CO2]	[2M]
	e)	Compare positive feedback and negative feedback.	[L2][CO2]	[2M]
2.		Derive the equations for voltage gain, current gain, Input impedance, and output admittance for a BJT using h-Parameter model for BJT Transistor.	[L4][CO3]	[10M]
3.	a)	A CE amplifier has the h-parameters given by h_{ie} = 1000 Ω, h_{re} = $2x10^{-4}$, h_{fe}=50 and h_{oe} = 25 μ mho .if both the load and source resistances are 1KΩ, determine the current gain & voltage gain.	[L3][CO3]	[5M]
	b)	Discuss the frequency response of CE amplifier with a neat diagram.	[L2][CO2]	[5M]
4.		Derive the equations for voltage gain, current gain, Input impedance, and output Impedance for a BJT using Approximate model in CC configuration.	[L4][CO3]	[10M]
5.		For a CB transistor amplifier driven by a voltage source of internal resistance R_s = 1200Ω, the load impedance is resistor R_L =1000 Ω.The h-parameters are h_{ib}=22 Ω, h_{rb}=$3x10^{-4}$,h_{fb}=-0.98 and h_{ob}=0.5μA/V. Compute the current gain A_I, Input impedance R_i,voltage gain A_v,output impedance Z_o, A_{IS} & A_{VS} using simplified model.	[L3][CO3]	[10M]
6.		Explain the concept of Feedback amplifier with block diagram and general structure.	[L2][CO2]	[10M]
7.	a)	Sketch the four types of feedback amplifier topologies.	[L3][CO2]	[5M]
	b)	An RC coupled amplifier has a mid-frequency gain of 200 and a frequency response from 100 Hz to 20 kHz. A negative feedback network with = 0.02 is incorporated into the amplifier circuit. Determine the new system performance.	[L3][CO3]	[5M]
8.	a)	Describe the effect of input resistance for Voltage shunt feedback amplifier.	[L2][CO3]	[5M]
	b)	Describe the effect of input resistance for current shunt feedback amplifier.	[L2][CO2]	[5M]
9.	a)	A voltage series negative feedback amplifier has a voltage gain without feedback of A = 500, input resistance R_i = 3kΩ, output resistance R_o = 20kΩ and feedback ratio β =0.01. Calculate the voltage gain A_f , input resistance R_{if} and output resistance R_{of} of the amplifier with feedback.	[L3][CO2]	[5M]
	b)	Enumerate the general characteristics of negative feedback amplifiers	[L1][CO2]	[5M]
10.	a)	Describe the effect of output resistance for current shunt feedback amplifier.	[L2][CO2]	[5M]
	b)	An amplifier has voltage gain with feedback of 100.if the gain without feedback changes by 20% and the gain with feedback should not vary more than 2%,determine the values of open loop gain A and feedback ratio β.	[L2][CO3]	[5M]
11	a)	Describe the effect of output resistance for Voltage series feedback amplifier.	[L2][CO2]	[5M]
	b)	Describe the effect of Input resistance for Voltage series feedback amplifier.	[L2][CO2]	[5M]

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Unit III
Oscillator circuit

1.	a)	List out different types of oscillator?	[L1][CO1]	**[2M]**
	b)	What is the necessary condition for sustained oscillations?	[L1][CO1]	**[2M]**
	c)	Define op-amp.	[L1][CO1]	**[2M]**
	d)	What is slew rate?	[L1][CO1]	**[2M]**
	e)	Draw the IC 741 op-amp pin configuration.	[L1][CO1]	**[2M]**
2.	a)	Explain Barkhausen criterion for oscillations with suitable diagram.	[L2][CO1]	**[5M]**
	b)	Interpret the various types of oscillators.	[L2][CO1]	**[5M]**
3.	a)	Determine the condition for sustained oscillations for an RC phase shift Oscillator with necessary circuit diagrams.	[L3][CO3]	**[5M]**
	b)	Determine the frequency of oscillations when an RC phase shift oscillator has R=10 kΩ, C=0.01μF and R_C = 2.2 kΩ.	[L3][CO6]	**[5M]**
4.	a)	Explain the working principle of Wein-bridge oscillator using BJT and Derive the expression for frequency of sustained oscillations.	[L4][CO3]	**[5M]**
	b)	In a Wien bridge oscillator, if the value of R is 100 kΩ and frequency of oscillation is 10kHz, examine the value of capacitor C.	[L3][CO6]	**[5M]**
5.	a)	Draw the circuit diagram of Colpitts crystal oscillator using BJT and show the expression for frequency of oscillations.	[L3][CO3]	**[5M]**
	b)	Sketch the symbol ,Equivalent circuit and relation between reactance and frequency of piezoelectric crystal	[L2][CO3]	**[5M]**
6.		A crystal has the following parameters: L = 0.5 H, Cs = 0.06 pF, Cp = = 1pF, and R = 5kΩ. Find the series and parallel resonant frequencies and the Q-factor of the crystal.	[L3][CO3]	**[10M]**
7.	**a)**	Draw the schematic symbol of an op-amp and list the different terminals with their features.	[L1][CO1]	**[5M]**
	b)	Draw the equivalent circuit diagram of Op-amp and list out the ideal characteristics of an operational amplifier.	[L1][CO1]	**[5M]**
8.	a)	For a given op-amp, CMMR = 10^5 and differential gain $A_d = 10^5$ .Determine the common mode gain A_{cm} of the op-amp.	[L2][CO5]	**[5M]**
	b)	Discuss the term common mode rejection ration (CMMR) in op-amp.	[L2][CO5]	**[5M]**
9.	a)	Explain AC characteristics of op-amp.	[L2][CO5]	**[6M]**
	b)	What are the features of IC 741 Op-amp?	[L1][CO3]	**[4M]**
10.	a)	Explain the term slew rate and illustrate the importance in op-amp circuits.	[L2][CO5]	**[6M]**
	b)	An op-amp has a slew rate of 2V/μs. What is the maximum frequency of an output sinusoidal its peak value of 5V at which the distortion sets in due to the slew rate limitation?	[L1][CO6]	**[4M]**
11.	a)	Explain about block diagram of typical Op-amp in detail.	[L2][CO3]	**[5M]**
	b)	Explain DC characteristics of op-amp.	[L2][CO3]	**[5M]**

Unit IV

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Op-Amp Applications

1.	a)	Define common mode Rejection Ratio.	[L1][CO1]	**[2M]**
	b)	Draw equivalent circuit of an ideal Op-Amp	[L1][CO1]	**[2M]**
	c)	List out the specifications of 741 IC.	[L1][CO1]	**[2M]**
	d)	List the applications of Astable Multivibrator	[L1][CO1]	**[2M]**
	e)	What are the types of Multivibrators?	[L1][CO1]	**[2M]**
2.	a)	Explain the operation of inverting summing amplifier.	[L2][CO5]	**[5M]**
	b)	For the Non-inverting amplifier ,R_1=1kΩ and R_f = 10kΩ.Calculate the closed-loop voltage gain of the amplifier and the feedback factor β	[L3][CO6]	**[5M]**
3.	a)	Draw the circuit diagram of subtractor using Op-amp and explain its operation.	[L2][CO5]	**[5M]**
	b)	Explain about Non Inverting AC amplifier using Op-amp?	[L2][CO4]	**[5M]**
4.	a)	For a V-I converter V_{in} = 5_V, R= 10kΩ , V1= 1_V,Find the load current and output voltage Vo.Assume the Op-amp is initially nulled.	[L3][CO6]	**[5M]**
	b)	Design a differentiator circuit with sine wave input using op-amp.	[L6][CO5]	**[5M]**
5.	a)	Discuss applications of I to V and V to I converters.	[L2][CO5]	**[5M]**
	b)	Design an op-amp differentiator that will differentiate an input signal with f_{max} =100 Hz	[L6][CO6]	**[5M]**
6.	a)	List out the applications of analog multiplier and draw the schematic symbol of multiplier.	[L1][CO5]	**[5M]**
	b)	Explain the operation of integrator using op-amp with a neat circuit diagram and draw the input-output waveforms?	[L2][CO5]	**[5M]**
7.		Explain about Instrumentation amplifier with neat circuit diagram.	[L2][CO4]	**[10M]**
8.		Explain the operation of triangular wave generator using op-amp, with a neat circuit diagram and its waveforms.	[L2][CO4]	**[10M]**
9.	a)	Explain about square wave generator with neat diagram using op-amp.	[L2][CO4]	**[5M]**
	b)	Draw the circuit of Basic log amplifier and explain its operation.	[L2][CO5]	**[5M]**
10.	a)	Explain the operation of monostable multivibrator using op-amp ,with a neat circuit and its waveforms	[L2][CO6]	**[5M]**
	b)	List the different types of comparators and draw the transfer characteristics of ideal comparator.	[L1][CO4]	**[5M]**
11.	a)	Draw the circuit diagram of Non-Inverting comparator & explain its operation.	[L2][CO4]	**[5M]**
	b)	How does the sample and hold circuit operate during the "sample" mode.	[L2][CO4]	**[5M]**

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Unit V
Op-Amp Applications

1.	a)	Draw the pin configuration of 555 timer.	[L1][CO1]	**[2M]**
	b)	What is a phase locked loop?	[L1][CO1]	**[2M]**
	c)	List out the examples of digital phase detectors.	[L1][CO1]	**[2M]**
	d)	Define monostable multivibrator.	[L1][CO1]	**[2M]**
	e)	What are the specifications of ADC and DAC?	[L1][CO1]	**[2M]**
2.	a)	Explain about 555 timer functional diagram.	[L2][CO1]	**[5M]**
	b)	Discuss about Schmitt trigger using 555 IC.	[L2][CO1]	**[5M]**
3.	a)	Draw a neat circuit of astable multivibrator using 555 IC and explain operation with waveforms.	[L2][CO5]	**[5M]**
	b)	In the astable multivibrator, R_A =2.2kΩ, R_B=3.9kΩ and C=0.1μF.Determine the positive pulse width t_c, negative pulse width t_d and free-running frequency fo.	[L3][CO6]	**[5M]**
4.	a)	Explain the operation of monostable multivibrator using 555 IC,with a neat circuit and its waveforms	[L2][CO5]	**[5M]**
	b)	Draw SE566 VCO connection diagram and explain its operation.	[L2][CO5]	**[5M]**
5.		Explain about PLL principle in detail and block diagram	[L2][CO5]	**[10M]**
6.	a)	Explain the Binary weighted resistor DAC with a neat diagram.	[L2][CO4]	**[5M]**
	b)	Draw the circuit diagram of inverted R-2R DAC and explain its operation.	[L2][CO4]	**[5M]**
7.	a)	Explain in detail about R-2R DAC with a neat diagram.	[L2][CO4]	**[5M]**
	b)	The basic step of a 9 bit DAC is 10.3 mV. If "000000000" represents 0 V. What output is produced if the input is "101101111"?	[L3][CO6]	**[5M]**
8.		Consider a 4 bit R-2R ladder DAC of the a) Given R=10kΩ and V_R=10V.Determine the value of the feedback resistance R_f for the following output condition. i) Value of 1 LSB at the output is 0.5V. ii) Analog output is 6V for a binary input of 1000. iii) Full scale output voltage is 10V.	[L2][CO6]	**[10M]**
9.		Explain about the flash type ADC using op-amp with the truth table using 8 by 3 priority encoder.	[L2][CO4]	**[10M]**
10.		Draw the circuit diagram of Dual Slope ADC and explain its working with neat sketches.	[L2][CO4]	**[10M]**
11.		Discuss the parameters specifications of DAC/ADC.	[L2][CO4]	**[10M]**