SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
(Approved by AICTE, New Delhi& Affiliated to JNTUA, Ananthapuramu)
(Accredited by NBA for Civil, EEE, Mech., ECE & CSE)
(Accredited by NAAC with 'A+' Grade)
Puttur -517583, Tirupathi District, A.P. (India)

QUESTION BANK (DESCRIPTIVE)

SUBJECT & CODE:	Analog Electronic circuits(20EC0446)	**COURSE & BRANCH:**	B.TECH - EEE
YEAR & SEM:	IIYR & I SEM	**REGULATION:**	R-20

UNIT –I
FEEDBACK AMPLIFIERS

1.	**a)**	Define feedback and illustrate the basic concept of Feedback with suitable block diagram.	**[L2][CO1]**	**[6M]**
	b)	List different types of feedback and discuss.	**[L1][CO1]**	**[6M]**
2.	**a)**	Compare positive feedback and negative feedback.	**[L2][CO2]**	**[6M]**
	b)	Give the classification of basic amplifiers.	**[L2][CO2]**	**[6M]**
3.	**a)**	Interpret voltage series and current series amplifier topologies with necessary diagrams.	**[L2][CO1]**	**[6M]**
	b)	Interpret voltage shunt and current shunt amplifier topologies with necessary diagrams.	**[L2][CO1]**	**[6M]**
4.	**a)**	Summarize the expressions of input and output resistances for a Voltage Series feedback amplifier with necessary derivations.	**[L2][CO4]**	**[8M]**
	b)	A voltage series negative feedback amplifier has a voltage gain without feedback of A=500, input resistance R_i=3 kΩ, output resistance R_o=20 kΩ and feedback ratio β=0.01.Calculate the voltage gain A_f, input resistance and output resistance of the amplifier with feedback.	**[L3][CO3]**	**[4M]**
5.		Summarize the expressions of Gain, input and output resistances for a Current Series feedback amplifier with necessary derivations.	**[L2][CO4]**	**[12M]**
6.		Summarize the expressions of Gain, input and output resistances for a current shunt feedback amplifier with necessary derivations.	**[L2][CO4]**	**[12M]**
7.		Summarize the expressions of Gain, input and output resistances for a Voltage Shunt feedback amplifier with necessary derivations.	**[L2][CO4]**	**[12M]**
8.	**a)**	List the characteristics of negative feedback amplifiers.	**[L1][CO1]**	**[6M]**
	b)	Explain about Noise reduction and nonlinear distortion in negative feedback.	**[L3][CO1]**	**[6M]**
9.	**a)**	Show that how a negative feedback reduces gain of an amplifier.	**[L1][CO1]**	**[6M]**
	b)	An amplifier has open loop gain 1000 and feedback ratio of 0.04, if the open loop gain changes by 10% due to temperature, find the percentage change in the gain of the amplifier feedback.	**[L3][CO3]**	**[6M]**
10.	**a)**	Derive the expression for De-sensitivity (D).	**[L1][CO1]**	**[6M]**
	b)	Compare the performance of feedback amplifier.	**[L4][CO1]**	**[6M]**

UNIT-II
OSCILLATORS

1.	**a)**	Define Oscillator and explain its principle of operation.	**[L2][CO1]**	**[6M]**
	b)	Illustrate the condition for oscillation with suitable diagram.	**[L2][CO1]**	**[6M]**
2.	**a)**	Explain Barkhausen criterion for oscillations with suitable diagram.	**[L2][CO1]**	**[6M]**
	b)	Interpret the various types of oscillators.	**[L3][CO1]**	**[6M]**
3.	**a)**	Determine the condition for sustained oscillations for an RC phase shift Oscillator with necessary circuit diagrams.	**[L3][CO2]**	**[8M]**
	b)	Determine the frequency of oscillations when an RC phase shift oscillator has R=100 kΩ, C=0.01μF and R_C = 2.2 kΩ.	**[L3][CO4]**	**[4M]**
4.	**a)**	Explain the working principle of Wein-bridge oscillator using BJT and Derive the expression for frequency of sustained oscillations.	**[L2][CO5]**	**[8M]**
	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][CO3]**	**[4M]**
5.	**a)**	Draw the circuit diagram of general form of an LC oscillator also give the expression for frequency of oscillation.	**[L1][CO1]**	**[6M]**
	b)	Derive the load impedance equation of a generalized LC Oscillator.	**[L3][CO1]**	**[6M]**
6.	**a)**	Draw the circuit diagram of Hartley oscillator using BJT and derive the expression for frequency of oscillations.	**[L1] [CO1]**	**[8M]**
	b)	In the Hartley oscillator L_2=0.4mH and C=0.004μF. If the frequency of the oscillator is 120kHz, find the value of L_1.Neglect mutual inductance.	**[L3][CO4]**	**[4M]**
7.	**a)**	Draw the circuit diagram of Colpitts oscillator using BJT and derive the expression for frequency of oscillations.	**[L1][CO1]**	**[8M]**
	b)	In the Colpitts oscillator, C_1=0.2μF and C_2 = 0.02μF.If the frequency of oscillator is 10kHz, find the value of inductor.	**[L3][CO4]**	**[4M]**
8.	**a)**	Summarize the difference between Hartley and Colpitts oscillator.	**[L2][CO4]**	**[6M]**
	b)	In a transistorized Hartley, oscillator the two inductances are 2mH and 20μH.While the frequency is to be changed from 950 kHz to 2050 kHz. Calculate the range over which the capacitor is to be varied.	**[L4][CO4]**	**[6M]**
9.	**a)**	Explain in detail about the crystal oscillator and mention the expression for its frequency of oscillation.	**[L2][CO1]**	**[8M]**
	b)	Compare piezoelectric effect and inverse piezoelectric effect with a neat diagram.	**[L2][CO6]**	**[4M]**
10.	**a)**	Summarize the difference between LC and Crystal oscillator.	**[L2][CO4]**	**[4M]**
	b)	Explain the concept of stability in oscillators in detail.	**[L2][CO6]**	**[8M]**

UNIT-III
OPERATIONAL AMPLIFIER

1.	**a)**	Explain the basic information and pin configuration of an op-amp.	**[L2] [CO1]**	**[6M]**
	b)	Draw the equivalent circuit diagram of Op-amp and list out the ideal characteristics of an operational amplifier.	**[L1][CO3]**	**[6M]**
2.	**a)**	Derive the expression for gain of inverting amplifier.	**[L3][CO5]**	**[6M]**
	b)	For an inverting amplifier, R_1=10kohm, R_f=100 kΩ with input voltage V_i=1V and a load resistance of RL=25 kΩ is connected to the output terminal. Calculate i) i_1 ii)V_o iii) i_L and iv) load current i_o into the output pin.	**[L3][CO4]**	**[6M]**
3.	**a)**	Derive the expression for gain of non-inverting amplifier.	**[L3][CO5]**	**[6M]**
	b)	For an Non-inverting amplifier, R_1=5kohm, R_f=20 kΩ with input voltage V_i=1V and a load resistance of RL=5 kΩ is connected to the output terminal. Calculate i)V_o ii)A_{CL} iii) i_L and iv) load current i_o indicating proper direction of flow.	**[L3][CO4]**	**[6M]**
4.	**a)**	What is voltage follower? What are its features and applications?	**[L1][CO1]**	**[6M]**
	b)	Estimate the gain of a Differential amplifier.	**[L4][CO2]**	**[6M]**
5	**a)**	What are the four different configuration of differential amplifier?	**[L1][CO1]**	**[6M]**
	b)	Derive the expression for gain of Differential amplifier with two op-amps.	**[L3][CO5]**	**[6M]**
6.	**a)**	Define the terms differential mode gain, common mode gain, CMRR.	**[L1][CO2]**	**[6M]**
	b)	Explain DC characteristics of op-amp.	**[L2][CO3]**	**[6M]**
7.	**a)**	Illustrate the following terms with neat diagram i)Input bias current ii)Input offset current.	**[L3][CO1]**	**[6M]**
	b)	Illustrate the following terms with neat diagram i)Input offset voltage ii)Thermal drift.	**[L3][CO1]**	**[6M]**
8.	**a)**	Explain AC characteristics of op-amp.	**[L2][CO5]**	**[8M]**
	b)	Draw and explain frequency response of practical op-amp.	**[L2][CO1]**	**[6M]**
9.	**a)**	What is frequency compensation and explain how the frequency response is varied with respect to External Compensation technique.	**[L1][CO6]**	**[8M]**
	b)	Explain how the frequency response is varied with respect to internal Compensation technique.	**[L2][CO5]**	**[4M]**
10.	**a)**	Explain the term slew rate and illustrate the importance in op-amp circuits.	**[L2][CO3]**	**[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][CO4]**	**[4M]**

UNIT-IV
APPLICATIONS OF THE OP-AMP

1.	**a)**	Design and explain the operation of inverting summing amplifier.	**[L3][CO3]**	**[6M]**
	b)	Design an inverting adder circuit using an op-amp to get the output expression as $V_o=-(0.1V_1+V_2+10V_3)$, Where V_1,V_2 and V_3 are the inputs.	**[L3][CO3]**	**[6M]**
2.	**a)**	Design and explain the operation of non-inverting summing amplifier.	**[L3][CO3]**	**[6M]**
	b)	The op-amp non-inverting summing circuit has the following parameters V_{CC} = +15 V, V_{EE} = -15V, R = R_1= 1 kΩ, R_f = 2 kΩ, V_1 = +2 V, V_2 = -3 V, V_3 = +4 V. Determine the output voltage $V_{o.}$	**[L3][CO3]**	**[6M]**
3.	**a)**	Draw the circuit of a subtractor using op-amp and derive the expression for voltage gain.	**[L3][CO1]**	**[6M]**
	b)	Draw an op-amp circuit whose output is $V_o=(V_3+V_4)-(V_1+V_2)$.	**[L3][CO1]**	**[6M]**
4.	**a)**	Explain the operation of differentiator using op-amp with a neat circuit diagram.	**[L2][CO5]**	**[6M]**
	b)	Draw the input-output waveforms and frequency response of differentiator.	**[L1][CO1]**	**[6M]**
5.	**a)**	Design a differentiator to differentiate an input signal that has $f_{max=}$100Hz .	**[L2][CO5]**	**[6M]**
	b)	Explain the operation of integrator using op-amp with a neat circuit diagram.	**[L3][CO5]**	**[6M]**
6.	**a)**	Draw the input-output waveforms and frequency response of integrator.	**[L1][CO1]**	**[6M]**
	b)	Explain sample and hold circuit using op-amp.	**[L2][CO1]**	**[6M]**
7.	**a)**	Draw a neat circuit of astable multivibrator using op-amp and explain operation with waveforms.	**[L2][CO2]**	**[6M]**
	b)	Define the duty cycle .Identify the percentage of duty cycle if T_{on}=0.6 msec ,T_{off}=0.4 msec	**[L3][CO4]**	**[6M]**
8.	**a)**	Derive the equation for frequency of oscillation of astable multivibrator using op-amp.	**[L3][CO4]**	**[6M]**
	b)	Calculate the frequency of oscillation for an astable multivibrator having R_2=10 kΩ,R_1=8.6 kΩ,R_f=100 kΩ and C=0.01 μF .	**[L4][CO4]**	**[6M]**
9.	**a)**	Explain the operation of monostable multivibrator using op-amp ,with a neat circuit and its waveforms	**[L2][CO2]**	**[6M]**
	b)	Derive the equation for pulse width of the monostable multivibrator using op-amp.	**[L3][CO4]**	**[6M]**
10.		Explain the operation of triangular wave generator using op-amp, with a neat circuit diagram and its waveforms.	**[L2][CO3]**	**[12M]**

UNIT-V
ACTIVE FILTERS AND CONVERTERS USING OP-AMP

1.	**a)**	Define active filter and give its characteristics.	**[L4][CO2]**	**[6M]**
	b)	Explain the first order low pass butter worth filter with a neat circuit diagram.	**[L2][CO2]**	**[6M]**
2.	**a)**	Draw the frequency response of filters.	**[L3][CO1]**	**[6M]**
	b)	Explain the first order high pass butter worth filter with a neat circuit diagram.	**[L2][CO2]**	**[6M]**
3.		Design a low pass filter at a cut-of frequency of 15.9kHz with pass band gain of 1.5 and draw the frequency response.	**[L3][CO3]**	**[12M]**
4.		Design a high pass filter at a cut-of frequency of 10kHz with pass band gain 1.5 and draw the frequency response.	**[L3][CO3]**	**[12M]**
5.	**a)**	Explain the weighted resistor DAC with a neat diagram.	**[L2][CO2]**	**[6M]**
	b)	An 8-bit Analog to Digital converter has a supply voltage of +12 volts. Calculate: (i) The voltage step size for LSB. (ii) The value of analog input voltage for a digital output of 01001011.	**[L4][CO4]**	**[6M]**
6.	**a)**	Explain in detail about R-2R DAC with a neat diagram.	**[L2][CO3]**	**[6M]**
	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”?	**[L1][CO4]**	**[6M]**
7.	**a)**	Draw the circuit diagram of inverted R-2R DAC and explain its operation.	**[L2][CO2]**	**[6M]**
	b)	Design an inverted R-2R ladder DAC for digital input word 001.	**[L3][C04]**	**[6M]**
8.	**a)**	Explain about the flash type ADC using op-amp.	**[L2][CO1]**	**[6M]**
	b)	Summarize the truth table for a flash type op-amp ADC using 8 by 3 priority encoder.	**[L2][CO4]**	**[6M]**
9.		Draw the circuit diagram of Dual Slope ADC and explain its working with neat sketches.	**[L2][CO2]**	**[12M]**
10.		Discuss the parameter and specifications of DAC/ADC.	**[L2]][CO1]**	**[12M]**

Prepared by

Mrs. D. Sakunthala, Assistant Professor,

Mrs. P Saranya, Assistant Professor,

Department of ECE,

SIETK, Puttur.