UNIT-I FEEDBACK AMPLIFIERS

PART-A

1. List the effects of negative feedback on the noise and bandwidth of the amplifier. **(May/June 2016)**

Bandwidth of amplifier with feedback is greater than bandwidth of amplifier without feedback. The noise is reduced with the negative feedback.

2. Calculate the voltage gain and output voltage of a negative feedback amplifier with A=120,β=0.05,V_s=75mV. **(May/June 2016)**

Soln: $A_f = A \div (1 + A\beta)$

A_f=120/(1+120*0.05)

A_f =17.14

V_o =A*V =120*7.5*10^{-3} =9v

3.An amplifier has an open loop gain of 1000 and a feedback ratio of 0.04.If the open loop gain changes by 10% due to temperature, find the % change in gain of the amplifier with feedback. **(Nov/Dec 2016)**

A_V=1000, β=0.04, dA/A=10
d A_f/ A_f = dA/A(1/1+A β)
= 10*(1/1+1000*0.04)
=24.39%

dA_f/ A_f =24.39%

4. List the properties of negative feedback amplifier. **(APRIL/MAY 2015)**

1. It improves the stability of the circuit.

2. It improves the frequency response of the amplifier.

3. It improves the percentage of harmonic distortion.

4. It improves the signal to noise ratio (SNR).

5. It reduces the gain of the circuit.

5. The voltage gain without negative feedback is 40dB.What is the new voltage gain if 3% negative feedback is introduced? **(APRIL/MAY 2015) & (NOV/DEC 2017)**

$A_f=A/(1+A\beta)$
$=40/(1+0.03*40)$
$A_f=18.18$

6.A negative feedback amplifier has a bandwidth of 250KHz and desensitivity factor of 4.What is the bandwidth of the basic amplifier without feedback.**(Nov/Dec 2015)**

$BW_f=BW*(1+A\beta)$
$D=(1+A\beta)=4$
$250*10^3 = BW*4$
$BW=(250*10^3)/4=62.5KHz$

7. what is the effect of negative feedback on circuit noise? **(APRIL/MAY 2017)**

The noise is reduced with the negative feedback.

$N'=N/(1+A\beta)$

8. The distortion in an amplifier is found to be 3%, when the feedback ratio of negative feedback amplifier is 0.04. When the feedback is removed, the distortion becomes 15%. Find the open and closed loop gain.

Given: $\beta = 0.04$
Distortion with feedback = 3%,
Distortion without feedback = 15%
Where $D = 1+A\beta =15/3=5$

9.What is negative feedback?

When input signal and part of the output signal are in out of phase, the feedback is called negative feedback.

10.A feedback amplifier has an open loop gain of 600 and β=0.01.Find the closed loop gain with negative feedback.

$A_f =A/(1+A\beta)$
$=600/(1+0.01*600)$ $A_f=85.74$

11. In a negative feedback amplifier A=100,β=0.04,Vs =50 mV find a)Gain with feedback b) Output voltage c) Feedback factor d) feedback voltage.(Nov/Dec 2013).

(i) $A_f = A/(1+\beta A)$
$= 100/(1+0.04*100)$ $\boxed{A_f = 20}$

(ii) $Av=Vo/Vs$
$Vo=Av*Vs$
$=100*50mV$ $\boxed{Vo=5000mV}$

(iii) Feedback factor = 0.04.

(iv) feedback voltage (Vf) =β*Vo =0.04*5000*10^3

$\boxed{Vf = 200mV}$

12.Calculate the closed loop gain of a negative feedback amplifier of its open loop gain is 100,000 and feedback factor is 0.01.

$Av_f = Av/(1+\beta A_{vf})$
$= 100,000/(1+0.01*100000)$ $\boxed{Av_f = 99.9}$

13.What is the effect on input and output impedance of an amplifier if its employs voltage series negative amplifier

Input Impedance increases $R_{if} = R_i(1+\beta A)$

Output Impedance decreases $R_{of} = R_o/(1+\beta A)$

14.Write the expression for gain with feedback for positive and negative feedback.

For positive feedback: $A_f = A / (1-A\beta)$

For negative feedback: $A_f = A / (1+A\beta)$

Where, A_f = Amplifier gain with feedback.

A = Amplifier gain without feedback.

β = Feedback factor

15. Define Desensitivity D?

Desensitivity is defined as the reciprocal of sensitivity. It indicates the factor by which the voltage gain has been reduced due to feedback network.

Desensitivity factor (D) = $1+A\beta$ where, A = Amplifier gain, β = Feedback factor.

16. State the nyquist criterion for stability of feedback amplifiers?

1. The amplifier is unstable if the curve encloses the point -1+j0. The system is called as unstable system.
2. The amplifier is stable if the curve encloses the point -1+jo. That system is called as stable system.

17. What is nyquist diagram?

The plot which shows the relationship between gain and phase-shift as a function of frequency is called as nyquist diagram.

18.Write the steps which are used to identify the method of feedback topology?

1. Identify topology (type of feedback)
a) To find the type of sampling network.
b) To find the type of mixing network
2. Find the input circuit.
3. Find the output circuit.
4. Replace each active device by its h-parameter model at low frequency.
5. Find the open loop gain (gain without feedback), A of the amplifier.
6. Indicate Xf and Xo on the circuit and evaluate β = Xf /XO.
7. Calculate A, and β, find D, Ai,Rif,Rof,and Rof'.

19.List the four basic feedback topologies.

1. Voltage amplifier with voltage series feedback.
2. Transconductance amplifier with current-series feedback.
3. Current amplifier with current-shunt feedback
4. Transresistance amplifier with voltage shunt feedback

20.What is positive feedback?

When input signal and part of the output signal are in phase, the feedback is called positive feedback.

PART-B

1. Draw the circuit diagram of a single stage Common Emitter amplifier that uses emitter current feedback. Analyze the circuit and derive equations for gain, input and output impedance with feedback. **(May/June 2016)**

2. With the help of a neat schematic (topology),discuss the classification of feedback amplifiers. Discuss qualitatively, the effect of topology of a feedback output resistance of shunt-series feedback amplifier. **(May/June 2016)**

3.Draw the block diagram of current series feedback amplifier and derive an expression for input resistance, voltage gain and output resistance. **(Nov/Dec 2016)**

4. Explain the working of voltage series feedback amplifier with circuit diagram and small signal equivalent circuit. Derive the expressions for voltage gain, input impedance and output impedance.**(April/May 2015) &(NOV/DEC 2017)**

5.Explain in detail about the stability of three pole amplifier.**(Nov/Dec 2015)**

6.(i)Sketch the block diagram of a feedback amplifier and derive the expressions for gain with positive feedback and with negative feedback**(APRIL/MAY 2017)**

(ii) An amplifier has voltage gain with feedback as100.If the gain without feedback changes by 20% and the gain with feedback should not varymore than 2%,determine the values of open loop gain and feedback ratio.**(APRIL/MAY 2017)**

7.(i)Draw the circuits of voltage shunt and current series feedback amplifiers and derive the expression for input impedance.**(APRIL/MAY 2017)**

(ii)write about the Nyquist criteria for stability of feedback amplifiers**(APRIL/MAY 2017)**

8. What is the effect of a current series negative feedback on input resistance and output resistance of a BJT amplifier? Explain the same with necessary circuit, equivalent circuit and equations.**(APRIL/MAY 2017)**

UNIT-II OSCILLATORS

PART-A

1. Sketch the feedback circuit of a Colpitts Oscillator .Calculate the value of the equivalent series capacitance required if it uses an inductance of 100mH and is to oscillator at 40 kHz. **(May/June 2016)**

$f=1/2\pi\sqrt{LC}$.

$40*10^3 =1/2\pi\sqrt{100m} * C$ C= 0.1587nF

2. Mention the advantages and disadvantages of RC phase shift oscillators.**(May/June 2016)**

Advantages:

i. It is best suited for generating fixed frequency signals in the audio frequency range.

ii. Simple Circuit. iiiPure sine wave output is possible.

Disadvantages:

i. It is ideal for frequency adjustment over a wide range.

ii. It requires a high β transistor to overcome losses in the network.

3.What are the factors which affect the frequency stablility of an oscillator? **(Nov/Dec 2016)**

1. Due to variation in the power supply, unstable transistor parameters, change in climatic conditions and aging.

2.Due th variation in biasing conditions and loading conditions.

3.The effective resistance of the tank circuit is changed when the load is connected.

4. Write the feedback factor expression for BJT transistor based Wein bridge oscillator **(APRIL/MAY 2015)**

$$\beta = \frac{sRC}{s^2R^2C^2+3sRC+1}$$

5. State Barkhausen criterion? **(APRIL/MAY 2015) & (APRIL/MAY 2017) &(NOV/DEC 2017)**

The conditions for oscillator to produce oscillation are given by Barkhausen criterion. They are:

(i) the total phase shift produced by the circuit should be 360^o or 0^o

(ii) The Magnitude of loop gain must be greater than or equal to 1 i.e. $|A.\beta| \geq 1$.

6. How Barkhausen conditions are satisfied in Twin T oscillators? .**(Nov/Dec 2015)**

Twin T oscillator circuit of Twin T network(two resistor connected in series and capacitor at stem forms T network),which produces 180^0 phase shift and Darlington pair circuit produces additional 180^0 phase shift satisfying Barkhausen criteria.

7. In a Hartley Oscillator, if L_1=0.2mH, L_2=0.3mH and C=0.003µF.Calculate the frequency of its oscillation. **(APRIL/MAY 2017)**

$$f_r = \frac{1}{2\pi\sqrt{L_T C}}$$

$L_1=(0.2+0.5)*10^{-3}$=0.5mH

F=2.43kHz

8.Give any two examples for high frequency and low frequency oscillations

High frequency;. Hartley Oscillator ,Colpits Oscillator and Crystal Oscillator

Low frequency: RC phase shift and Wein bridge Oscillator.

9.What is the difference between open loop and closed loop gain of the circuit?

Open loop gain	Closed loop gain
The gain of the amplifier is ratio of output to input when no eedback is used is called open loop gain	The ratio of the output to input,considering the overall effect of the feedback is called closed loop gain.

10. Write down the general applications of oscillators.

a) As a local oscillator in radio receivers.
b) In T.V receivers.
c) In signal generators.
d) As clock generation for logic circuits.
e) AM and FM transmitters.
f) In phase lock loops.

11.In a RC phase shift oscillator if $R_1= R_2= R_3=200k\Omega$ and $C_1= C_2= C_3=100pF$,find the frequency of the oscillator.(April/May 2010)

$f = 1/2\pi RC\sqrt{6}$

$=1/2\pi*200*10^3*100*10^{-12}*\sqrt{6}$ $\boxed{f = 3.2kHz}$

12. How does an oscillator differ from an amplifier?

Oscillators	Amplifiers
1. They are self-generating circuits. They generate waveforms like sine, square and triangular waveforms of their own. Without having input signal.	1. They are not self-generating circuits. They need a signal at the input and they just increase the level of the input waveform.
2. It have infinite gain	2. It have finite gain
3. Oscillator uses positive feedback.	3. Amplifier uses negative feedback.

13. Define gain and phase Margin.

Gain Margin: It is defined as the value of $|A\beta|$ in decibels at the frequency at which the phase angle of $A\beta$ is 180^o, negative gain margin signifies decibel rise in open loop gain a theoretical possibility without oscillation. A positive gain margin signifies that amplifier is potentially unstable.

Phase Margin: It is defined as 180^o minus the Magnitude of angle of $A\beta$ at the frequency at which $|A\beta|$ is unity.

14. What is piezo electric effect?

The piezo electric Crystals exhibit a property that if a mechanical stress is applied across one face the electric potential is developed across opposite face. The inverse is also live. This phenomenon is called piezo electric effect

15. A tuned collector oscillator in a radio receiver has a fixed inductance of 60μH and has to be tunable over the frequency band of 400kHz to1200kHz.Find the range of variable capacitor to be used.(April/May 2011) & (Nov/Dec 2011)

fr=1/2π√LC

C= 1/4π^2*fr^2*L

For fr =400kHz, C=2641pF,For fr =1200kHz, C=293pF.

16.A Wein Bridge Oscillator is used for operation at 9kHz.If the value of the resistance R is 100kΩ,what is the value of C required?(April/May 2011)
Solution:

f=1/2πRC
C=1/2π*100*10^3*9*10^3

C=176.5pF

17.Find the value of C in RC phase shift oscillator using BJT designed for a frequency of 1KHz having value of R is 10kΩ

f =1/2πRC$\sqrt{6}$, C=1/2πRf$\sqrt{6}$

Substitute the value of R and f , C=6.5nF

18.In a Colpitt's oscillator,the value of the inductor and capacitor in the tank circuit are L=40mH,C_1=100pF and C_2=500pF.(N0v/Dec 2012) & (April/May 2011)
(i) Find the frequency of oscillation.
(ii) If the output voltage is 10V,find the feedback voltage at the input side of the amplifier.
(iii) Find the minimum gain, if the frequency is changed by charging 'L' alone.
(iv) Find the value of C1 for a gain of 10 if C2 is kept constant as 500pF.Also find the resulting new frequency.

(i).Find the frequency of oscillation:

$$f = 1/(2\pi*\sqrt{(L * Ceq)}$$

Ceq = C1*C2/(C1+C2) = 83.33pF.

f = 1/(2π*√(40m ∗ 8.3p)

f = 87.2kHz.

(ii) lAβl =1

A=C_2/C_1.

$\beta = V_f/V_o$
$V_f/V_o * C_2/C_1 = 1$
$V_f = V_o * C_1/C_2$
$V_i = V_o = 10V$
$V_f = 10*100p/500p$ $\boxed{V_f = 2V}$ $=2V$

(iii) Minimum Gain hfe=C_2/C_1=5

(iv) hfe=10

$C_2/C_1 = 10$, $\mathbf{C}_1 = C_2/10 = 500p/10$ $\boxed{C_1 = 50pF}$

$C_1 = 50pF$, $C_1 = 500pF$
$Ceq = C_2 * C_1 / C_2 + C_1 = 45.45pF$

To find the new frequency of oscillation:
$f_1 = 1/(2\pi * \sqrt{(L * Ceq)}$
$=1/(2\pi * \sqrt{(40 * 10^{-3} * 45.45 * 10\text{^} - 12)}$ $\boxed{f_1 = 118kHz}$

19. What are the types of sinusoidal oscillator? Mention the different types of sinusoidal oscillator?

1. RC phase shift Oscillator.
2. Wein Bridge Oscillator.
3. Hartley Oscillator
4. Colpitts Oscillator
5. Crystal Oscillator

20. Why RC phase shift is needed in a RC phase shift Oscillator?

The amplifier used causes a phase shift of 180° than the feedback network should create phase shift of 180°, to satisfy the Barkhausen Criterion. Hence in a phase shift oscillators, three sections of RC circuit are connected in cascade, each introducing a shift of 60°, thus introducing a total phase shift of 180°, due to feedback network.

PART-B

1.Explain the principle of operation of Armstrong oscillator with a neat circuit diagram. **(May/June 2016)**

2. Draw the operation and the principle involved in Twin T Oscillators**.(May/June 2016)**

3. Discuss briefly the principle of oscillators in crystals and draw the equivalent circuit, Impedance frequency graph of crystals and give expression for its series and parallel resonant frequency. **(May/June 2016)**

4.Discuss about the frequency stability of crystal oscillator**(May/June 2016)**

5. Derive the general form for frequency of oscillations for LC oscillator with suitable diagram. **(Nov/Dec 2016) &(April/May 2015)**

6.Enumerate the following (i) Franklin Oscillator (ii) Armstrong Oscillator **(Nov/Dec 2016)**

7. Sketch the circuit and explain the operation of a RC phase shift oscillator .Derive the expression for frequency and condition for sustained oscillations for the circuit. **(APRIL/MAY 2015) & (APRIL/MAY 2017)**

8. A Colpitt's oscillator is designed with C_1=1μF and C_2=0.2μF. The inductance is variable. Determine the range of inductance values if the frequency of oscillation is 10kHz.Also find the required gain for sustained oscillation **(April/May 2015)**

9. Draw the Hartley Oscillator using FET, explain and derive the condition for oscillations **(April/May 2015)** &**(NOV/DEC 2017)**

10. Derive the frequency of oscillations of a Wein bridge oscillator. With the circuit diagram of its discrete version (using BJT).Explain how Barkhausen conditions are satisfied in Wein Bridge oscillators. **(Nov/Dec 2015)& (NOV/DEC 2017)**

11. With circuit diagram , explain the working principle of Colpits crystal oscillator .(**Nov/Dec 2015) & (APRIL/MAY 2017)**

12. In a Colpitt's Oscillator, if L=40mH,C_1=100pF and C_2=500pF .Calculate the frequency of its oscillation.**(APRIL/MAY 2017)**

13. In a Colpitt's Oscillator,C_1=1μF and C_2=0.2μF .If the frequency of its oscillation is 10KHz,find the value of inductor. Also find the required gain for sustained oscillation.**(NOV/DEC 2017)**

UNIT III TUNED AMPLIFIERS

PART-A

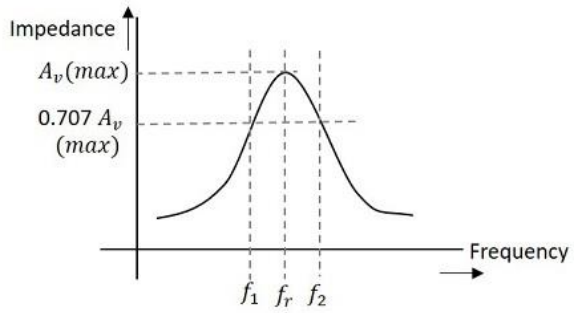
1. The Quartz crystal has C_m=1pF, L_s=3H, C_s=0.05pF and R_s=1K.Calculate the series and parallel resonant frequencies. **(Nov/Dec 2015)**

Series resonant frequency, $\omega_s=\frac{1}{\sqrt{LC}}=\frac{1}{\sqrt{3*0.05*10\text{^-}12}}$ =2.581MHz

Parallel resonant frequency $\omega p=1/\sqrt{LC_{eq}}$

C_{eq}= C_s*C_p/ C_s+C_p **ω_p**=2.645MHz

2.Draw the ideal response and actual response of tuned amplifiers**(May/June 2016)**



3.List out some advantages of double tuned amplifier. **(Nov/Dec 2016)**

1. It provides larger 3 dB bandwidth than the single tuned amplifier and hence provides the larger gain-bandwidth product.
2. It provides gain versus frequency curve having steeper sides and flatter top.

4.Define Q factor of the capacitor. **(Nov/Dec 2016)**

Q=1/ωCR

Maximum energy stored in the capacitor=$CV_{max}^2/2$

5.Determine the bandwidth of two stage synchronous tuned amplifier. Assume the bandwidth of individual stage is 310kHz. **(APRIL/MAY 2015)**

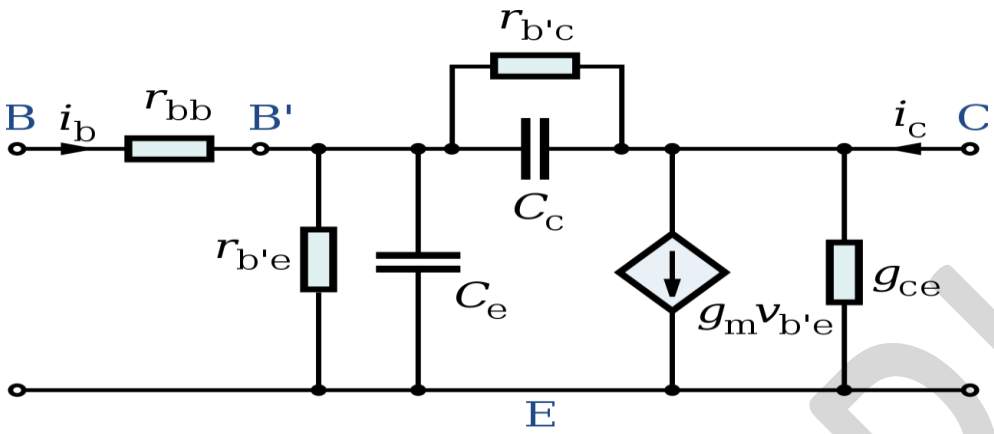
$BW_N=BW_1(\sqrt{(}2^{1/N}-1)$

Where N=2,BW=310kHz.

$BW_N=310*10^3(\sqrt{(}2^{1/2}-1)$

BW_N=248.6*10^3 Hz

6. Draw the small signal model of a single tuned amplifier**(APRIL/MAY 2015)**



7.What is meant by Neutralization **(Nov/Dec 2015)**

The technique used for the elimination of potential oscillations is called neutralization. (OR) The effect of collector to base capacitance of the transistor is neutralized by introducing a signal that cancels the signal coupled through collector base capacitance. This process is called neutralization

8. A tuned circuit has resonant frequency of 1600 kHz and a bandwidth of 10kHz.What is the value of its Q factor.What is the value of its Q factor? **(APRIL/MAY 2017)**

$Q=f_0/BW$,$Q=1600*10^3/10*10^3$,Q=160

9. Define resonance and Quality factor?

The reactance of the capacitor equals that of the inductor reactance. i.e ω_C. = 1 / ω_L..The ratio of inductive reactance of the coil at resonance to its resistance is known as quality factor. $Q = X_L / R$

10. A Low pass RC Circuit has R=1.5KΩ,C=0,2μF .What is the rise time of the output when excited by a step input ?(May/June2013).

tr =2.2RC

= 2.2*1.5*10^3*0.2*10^-6

= 6.6*10^-4 seconds

tr= 6.6*10^-4 seconds.

11.Determine the bandwidth of two stage synchronous tuned amplifier. Assume the bandwidth of individual stage is 200kHz. **(NOV/DEC 2017)**

$B_{In}=B_{1}*\sqrt{2^{\frac{1}{n}}-1}$

$=200*10^{3}*\sqrt{2\wedge\frac{1}{2}-1}$

B_{In}=128.7kHz

12.What are the various types of tuned amplifiers?
(1) Small signal tuned amplifiers
a. Single tuned amplifiers
(i) Capacitive coupled
(ii) Inductively coupled (or) Transformer coupled
b. Double tuned amplifiers
c. Stagger tuned amplifiers
(2) Large signal tuned amplifiers

13.Mention the applications of class C tuned amplifier.
1. Class C amplifiers are used primarily in high-power, high-frequency applications such as Radio-frequency transmitters.
2. In these applications, the high frequency pulses handled by the amplifier arenot themselves the signal, but constitute what is called the Carrier for the signal.
3. Amplitude modulation is one such example.
4. The principal advantage of class-C amplifier is that it has a higher efficiency than the other amplifiers.

14.List the advantages of tuned amplifiers.

1. They amplify defined frequencies.
2. Signal to Noise ratio at output is good.
3. They are well suited for radio transmitters and receivers.
4. The band of frequencies over which amplification is required can be varied.

15. List the disadvantages of tuned amplifiers.

1. Since they use inductors and capacitors as tuning elements, the circuit is bulky and costly.
2. If the band of frequency is increased, design becomes complex.
3. They are not suitable to amplify audio frequencies

16. The bandwidth of a double-tuned amplifier is 10 KHz. Calculate the number of such stages to be connected to obtain the bandwidth of 5.098 KHz.

$BW_T = BW_1 (2^{1/n} - 1)^{1/4}$

$2^{1/n} = 1.0676.$

Taking log on both sides,

1/n log (2) = log (1.0676), N=10

17. An inductor of 250µH has Q =300 at 1MHz.Determine Rs and Rp of the inductor. (N0v/Dec 2012).

Rp =ωo*L*Q^2
= 2*π*1M*250*10^-6*300*30 Rp=471.24kΩ
Rs= ωo*L/Q
=2*π*10^6*250*10^-6/300 Rs =5.235Ω

18. A tank circuit has a capacitor of 100pF and an inductor of 100µH. The resistance of the inductor is 5 ohms. Determine the resonant frequency , impedance at resonance, Q factor and Bandwidth**.**

Resonant frequency f=1/2π$\sqrt{LC}$ =1/2π$\sqrt{100 * 10^{-6} * 100 * 10^{-12}}$ =1592 kHz.

The Impedance of resonance=L/CR=200kohms

Quality factor Q=2π*fo*L/R =200

Bandwidth = fo/Q=7.96kHz

19. Classify tuned amplifiers.

1. Single tuned amplifier.
2. Double tuned amplifier.
3. Synchronously tuned amplifier.
4. Stagger tuned amplifier

20.Write the application of resonant circuit?

- The most common application of tank circuits is tuning radio transmitters and receivers.
- A series resonant circuit provides voltage magnification.
- A parallel resonant circuit provides current magnification.
- A parallel resonant circuit can be used as load impedance in output circuits of RF amplifiers. Due to high impedance, the gain of amplifier is maximum at resonant frequency.
- Both parallel and series resonant circuits are used in induction heat

PART-B

1. Describe the operation of a capacitance coupled single tuned amplifier and analyse the circuit with the high frequency transistor model to obtain the gain and bandwidth of the amplifier. Sketch its frequency response. **(May/June 2016)**

2. Discuss briefly the need for neutralization in tuned amplifiers. Explain Hazeltine and Neutrodyne neutralization methods with relevant circuit diagrams. **(May/June 2016), (Nov/Dec 2016) & (Nov/Dec 2015) &** (**APRIL/MAY 2017)**

3. Discuss the effect of cascading single tuned amplifier on bandwidth **(Nov/Dec 2016)**

4. Derive the efficiency of Class C tuned amplifier **(Nov/Dec 2016) & (Nov/Dec 2015)&** (**APRIL/MAY 2017)**

5. Explain the frequency response of a stagger tuned amplifier **(APRIL/MAY 2015)**

6. With circuit diagram and small signal equivalent circuit derive expression for selectivity characteristics of single tuned amplifier. Also derive for its 3dB cut off frequencies.

(Nov/Dec 2015)

7. Draw the circuit of a double tuned amplifier and explain its operation. Sketch the nature of frequency gain characteristics and write the expression for 3dB bandwidth.(**APRIL/MAY 2017)**

8. Design a tuned amplifier using FET to have f_o=1MHz.3dB bandwidth is to be 10kHz and maximum gain is to be -10.FET has g_m=5mA/V and r_d=10kΩ.(**APRIL/MAY 2017)**

9. A tank circuit having a 5mH coil with resistance 22Ω and C=1nF is connected as load to a single tuned amplifier with R_o=10K.calculate loaded and unloaded Quality factor. **(NOV/DEC 2017)**

UNIT IV WAVE SHAPING CIRCUITS

PART-A

1. If an astable multivibrator has $C_1=C_2=1000pF$ and R1=R2=20kΩ, calculate the frequency of oscillation.

f=1/1.386Rc

$=1/ (1.386x20x10^3x1000x10^{-12})$ f =36.25 kHz

2.State the role of commutating capacitors in bi-stable multivibrator. **(May/June 2016)& (NOV/DEC 2017)**

The Commutating capacitors can be used to reduce the transition time in a low to high level and vice versa.

3. What are the different types of multivibrator **(Nov/Dec 2016)**

1. Astable multivibrator
2. Bistable multivibrator
3. Monostable multivibrator

4.Mention the uses of Schmitt trigger circuit. **(Nov/Dec 2016)**

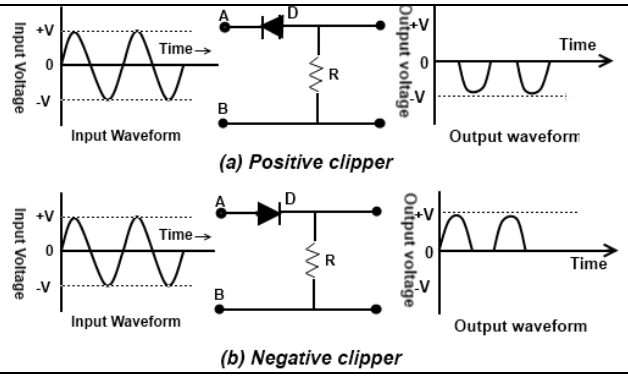
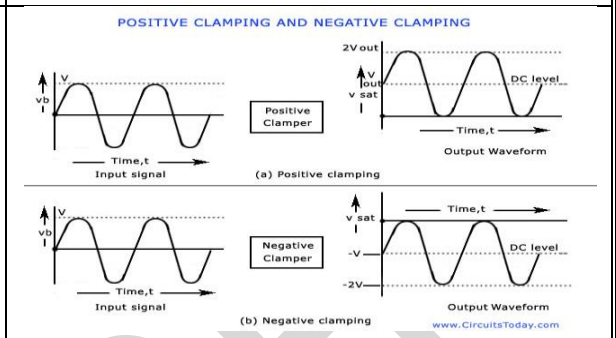
1. It is used for wave shaping circuits.
2. It can be used for generation of rectangular waveforms with sharp edges from a sine wave or any other waveform.
3. It can be used as a voltage comparator.
4. The Hysteresis in Schmitt trigger is valuable when conditioning noisy signals for using digital circuits. The noise does not cause false triggering and so the output will be free from noise.

5.Why high-pass RC circuit is called Differentiator?

High-pass RC circuit gives an output waveform similar to the first derivative of the input waveform. Hence it is called Differentiator

6. Differentiate Clippers & Clampers**(APRIL/MAY 2015)& (NOV/DEC 2017)**

S.NO	CLIPPER	CLAMPER
1	The circuit with which the waveform is shaped by removing a portion of the input signal without distorting the removing	Clamping network shifts (clamp) a signal to a different d.c level, i.e., it introduces a d.c level to an a.c

	part of the alternating waveform is called a clipper.	signal.Hence,the clamping network is known as d.c restorer.
2		

7.Why do we call astable multivibrator as free running multivibrator? **(APRIL/MAY 2017)**

The Astable multivibrator does not require any external pulse for transition, it is called free running Multivibrator.

8. How can a Schmitt Trigger act as a zero crossing detector? **(APRIL/MAY 2017)**

Schmitt Trigger act as a zero crossing detector when it has only one reference voltage i.e zero volts. The input voltage is applied to inverting terminal and fixed voltage i.e zero volts to non-inverting terminal and vice versa. It is open,loop system.

9.Define rise time of a switching transistor**(APRIL/MAY 2017)**

The time required for the collector current to rise from 10% to 90% of the maximum value is called rise time (tr).

10.What are the four categories of clippers?
1. Positive clipper
2. Negative clipper
3. Biased clipper
4. Combination clipper

11.What is meant by Hysteresis voltage in a Schmitt trigger?

The difference between UTP (Upper Threshold Point) and LTP (Lower Threshold Point) is called Hysteresis voltage (VH).It is also known as Dead Zone of the Schmitt trigger.

12.List the applications of Astable multivibrator?

1. Used as square wave generator, voltage to frequency convertor and in pulse synchronization, as clock for binary logic signals, and so on.
2. Since it produces square waves, it is a source of production of harmonic frequencies of higher order.
3. It is used in the construction of digital voltmeter and SMPS.
4. It can be operated as an oscillator over a wide range of audio and radio frequencies.

13. If the rise time of a BJT is 35ns, What is the bandwidth that can be obtained using this BJT?

tr=35ns,tr=0.35/BW

BW=0.35/tr=0.35/(35x10^{-9})=10Mhz BW=10MHz

14. What is meant by clippers?

The circuit with which the waveform is shaped by removing a portion of the input signal without distorting the removing part of the alternating waveform is called a clipper.

15. What is meant by clampers**?**

Clamping network shifts (clamp) a signal to a different d.c level, i.e., it introduces a d.c level to an a.c signal.Hence,the clamping network is known as d.c restorer.

16. What is delay time?

The time required for the current to rise to 10% of its maximum (saturation) value Ics is called the delay time t_d

17. What is the total turn on time?

The total turn on time is t_{on} is the sum of the delay time and rise time, $t_{on} = t_d + t_r$

Where,t_d = Delay time, t_r = Rise time.

18. What is storage time?

The interval that elapses between the transition of the input waveform and the time when the collector current has dropped to 90 % of total output is called the storage time t_s.

19. Define transition time.

The time interval during which the conduction transfer from one transistor to another transistor is defined as transition time.

20.How a Schmitt trigger is different from a multivibrator?

A Schmitt trigger has an input and an output; the output is a squared-up version of the input. As long as the input is constant, the output of the Schmitt trigger is also constant. A multivibrator typically has no inputs (other than power), only an output an oscillating signal.

PART-B

1.Explain the following (i) Positive clamper (ii) Negative clamper**(May/June 2016)**

2.Explain the operation of a Schmitt Trigger with a neat circuit diagram showing relevant input and output waveforms. **(May/June 2016)**

3. With neat circuit diagram, explain the operation of monostable multivibrator **(Nov/Dec 2016)**

4.Design a saturated collector coupled multivibrator for the following specifications. Output voltage 12V peak. Output to be positive pulse, the duration is 10µs.The time between pulses to be 20µs, for the BJT h_{fe}=100,I_{CBO}=0,$I_{C(ON)}$=1mA.Assume $V_{CE(sat)}$=0.2V**(Nov/Dec 2016)**

5. Design a Schmitt trigger circuit to have Vcc=15V,UTP=5V,LTP=3V and I_c=5mA using two silicon transistors with h_{fe}(min)=100 and I_2=0.1I_{c2} **(APRIL/MAY 2015)**

6. Explain a clamper and clipper circuit with input and output waveforms.**(Nov/Dec 2015)**

7.With switching characteristics of BJT, explain the cause of storage ,rise delay of off times and how they can be reduced to improve the switching time of BJT.**(Nov/Dec 2015)**

8. With neat circuit diagram, explain the operation of collector coupled astable multivibrator **(Nov/Dec 2015)**

9. Sketch a transistor switching circuit and its collector current response waveform for a pulse input, For such a circuit, explain the following terms(**APRIL/MAY 2017)**

(i)Delay time (ii)Turn on time (iii)Storage Time (iv)Fall Time (v)Turn off time.

10.With neat circuit diagram, explain the operation of bistable multivibrator (**APRIL/MAY 2017)**

11.Design a Astable multivibrator circuit to generate a pulse waveform at 40 duty cycle at 20kHz using V_{ce}=10V,h_{fe}=220,$I_{c\ sat}$=2mA.(**APRIL/MAY 2017)**

12. Explain the working of Schmitt Trigger with circuit. With the help of neat circuit diagram explain the working principle of emitter coupled astable multivibrator **(NOV/DEC 2017)**

13. Design and draw the Astable multivibrator circuit using BJT to generate a pulse waveform0-10V at 50% duty cycle with 5kHz .(**NOV/DEC 2017)**

UNIT V BLOCKING OSCILLATORS &TIME BASE GENERATORS

PART-A

1.What are the different methods for generation of ramp waveforms? **(May/June 2016)**

1.UJT Relaxation Oscillator

2.Miller Integrator

2.Give the applications of blocking oscillator. **(May/June 2016)**

1.Blocking oscillator, wave generator used to produce a narrow pulse, or trigger.

2. They can be used as frequency dividers or counter circuits and for switching other circuits on and off at specific times.

3.Drawthe Miller circuit to activate the sweep**(Nov/Dec 2016)**

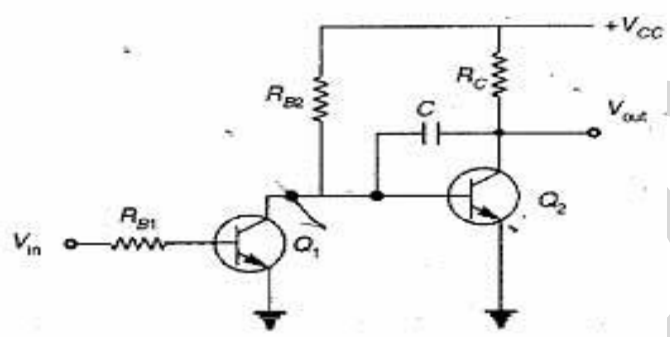


Figure : **Circuit diagram of Miller Inegrator**

4.What is known as intrinsic stand off ratio and mention its range? **(Nov/Dec 2016)**

It is the resistance between the terminals B1 and B2. In simple words, it is the resistance of the N-Type bar when measured lengthwise. If RB1 is the resistance of the bar from E to B1 and RB2 is the resistance of the bar from E to B2, then R_{BBO} can be expressed as R_{BBO}= RB1 +RB2. The typical range of intrinsic standoff ratio is from 0.4 to 0.8.

5.Name the different errors in generation of sweep waveforms.

1.Sweep speed error

2.Displacement error

3. transmission error.

6.What is Leading edge response?

At start there is an overshoot and then the pulse settles down. The response till it settles down after the overshoot is called leading edge response

7.Determine the frequency of oscillation of an UJT relaxation oscillator. Assume R_e=10.7k,Ce=0.22µF and intrinsic standoff ratio 0.56 **(NOV/DEC 2015)**

F = 1/ (RC ln(1/(1-η))

=1/(10.7*10^3*0.22*10^{-6}*ln(1/1-0.56)

=517.3Hz.

8. Mention the application of Voltage and Current Time base circuits**(NOV/DEC 2015)**

1. A time base generator is a special type of function generator, an electronic circuit that generates a varying voltage to produce a particular waveform.

2.Time base generators produce very high frequency sawtooth waves specifically designed to deflect the beam in cathode ray tube (CRT) smoothly across the face of the tube and then return it to its starting position.

3. Time bases are used by radar systems to determine range to a target, by comparing the current location along the time base to the time of arrival of radio echoes.

4. Analog television systems using CRTs had two time bases, one for deflecting the beam horizontally in a rapid movement, and another pulling it down the screen 60 times per second.

9. State any two applications of pulse transformer? **(APRIL/MAY 2017)**

Pulse transformer can be used to

1.change the amplitude and impedance level of a pulse

2.invert the polarity of a pulse

3.produce a pulse in a circuit having negligible dc resistance

4.effect dc isolation between source and load

5.couple between stages of pulse amplifiers

10.What is trailing edge response?

The response generally extends below the zero amplitude after the end of pulse width is called back swing. The portion of response from backswing till it settles down is trailing edge response.

11.Differentiate between monostable and astable multivibrators. **(NOV/DEC 2017)**

S.NO	Monostable Multivibrator	Astable multivibrator
1.	A monostable multivibrator needs a trigger signal to produce an output pulse	An **astable multivibrator** runs and needn't to be triggered for every output pulse.
2	Free running multivibrator	One shot multivibrator

12. What do you mean by free running blocking oscillator? Why they are called so?

Astable blocking oscillator is called as free running blocking oscillator .It produces train of pulses when triggered. The pulse width and the duty cycle of the blocking oscillator output can be controlled as per the requirement.

13. What is a sweep generator?

A sweep generator is a circuit that produces a sweep waveform. Sweep waveforms are those which have at least one portion in it with respect to time. There are different types of sweep generators like Miller time base sweep generator, Bootstrap sweep generator,etc.,

14. What is UJT relaxation oscillator?

A unijunction transistor in conjunction with a capacitor and a charging resistor to construct an oscillator with an approximate ramp type output is known as UJT relaxation oscillator.

15. What is a pulse transformer?

A pulse transformer is basically a transformer, which couples a source of pulses of electrical energy to the load keeping the shape and other properties of pulse unchanged. The voltage level of the pulse can be raised or lowered by designing the proper turns ratio for the pulse transformer

16.Define rise time of a pulse

The rise time is an important parameter related to this part of the response. It is defined by the time required by the pulse to rise from 10% of its amplitude to 90% of its amplitude.

17.Define Duty cycle.

The duty cycle is defined as the ratio of the ON time tp to the time period T.Mathematically it is given by, D= tp/T

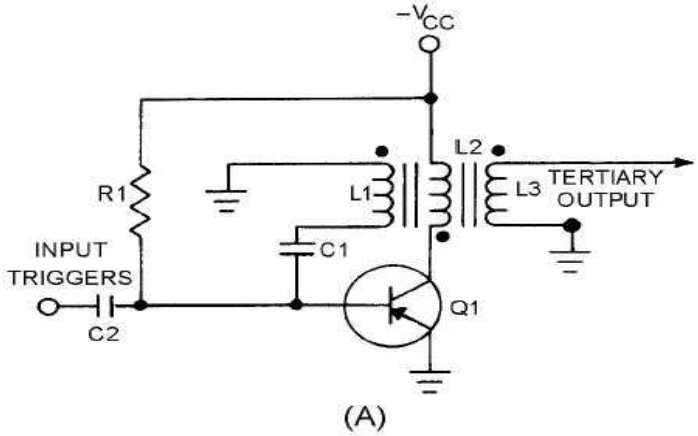
18.Define transmission error.

When a ramp voltage is transmitted through a high-pass RC network, its output fallsaway from the input. The transmission error is defined as the difference between the input and output divided by the input

19.What are Time Base generators?

The circuits which provide an output waveform, a part of which is characterized by a linear variation of voltage or current with respect to time are called Time Base Generators

20. Draw the schematic diagram of a free running blocking oscillator **(APRIL/MAY 2015)**



(A)

PART-B

1. With neat diagram and waveform explain the operation of a UJT relaxation oscillator. Derive the expressions for the sweep time and frequency of oscillation of the circuit **(May/June 2016) & (Nov/Dec 2016)**

2. Explain the operation and performance of a transistor current time base generator using a neat circuit diagram and relevant waveforms. **(May/June 2016)**

3. Analyze free running block oscillator with base timing using necessary circuit diagram and waveforms **(Nov/Dec 2016) &(NOV/DEC 2017)**

4.Explain in detail the monostable blocking oscillator with base timing.**(April/May 2015)**

5. Explain in detail the current time base circuits.**(April/May 2015)& (NOV/DEC 2017)**

6.(i)With neat circuit diagram and necessary waveforms, explain current sweep generator.

(NOV/DEC 2015)

(ii)Define three errors that characteristics the performance of time base generator. **(NOV/DEC 2015)**

7(i)Explain Astable blocking oscillator with emitter timing RC controlled and derive for its frequency with circuit and waveforms.**(NOV/DEC 2015)**

(ii**)**What are the advantages and disadvantages of the astable blocking oscillator?**(NOV/DEC 2015)**

8. Draw the circuit of an astable blocking oscillator with base timing. Sketch the waveforms of collector voltage, base voltage and magnetizing current. Explain the operation of the oscillator covering one full cycle with necessary equations. Also mention the advantages and disadvantages of this oscillator**. (APRIL/MAY 2017)**

9. With neat circuit diagram and necessary waveforms, explain current sweep generator.

(NOV/DEC 2017)