DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
K.S.R. COLLEGE OF ENGINEERING, TIRUCHENCODE – 637 215
COURSE/ LESSON PLAN SCHEDULE

STAFF NAME: P.THILAGAVATHI & Dr.P.S.PERIASAMY
CLASS: II B.E ECE (A & B)
SUBJECT: 16EC412 -ELECTRONICS CIRCUITS **ACADEMIC YEAR: 2018-2019**

A). TEXT BOOKS

1. Sedra / Smith, Micro Electronic Circuits Oxford University Press, 6th Edition /second Impression 2013.
2. Anil K Maini, VarshaAgarwal, Electronic Devices & Circuits, John Wiley India, Reprint 2012.

B). REFERENCE BOOKS

1. Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education / PHI, 2015
2. David A. Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2008.
3. Millman.J. and Halkias C.C, “Integrated Electronics”, McGraw Hill, 48thReprint 2008.
4. Schilling.D.L and Belove.C “Electronic Circuits” 3rd Edition, McGraw Hill 2002.
5. NPTEL Course Link:http://nptel.ac.in/courses/117108107/32

C).EXTRA REFERENCE BOOK

1. R.S.Sedha,”Applied Electronics” Multicolour Edition S.Chand & Company Ltd. 2010

D). LEGEND:

L - Lecture T - Tutorial BB - Black Board
OHP - Over Head Projector pp – Pages PPT – Power point
Tx - Text Book Rx - Reference

S.NO	LECTURE HOUR	TOPICS TO BE COVERED	TEACHING AID REQUIRED	BOOK NO/PAGE NO
UNIT – I LARGE SIGNAL AMPLIFIERS				
1	L1	Classification of amplifiers – RC coupled Class A amplifier	BB	Tx1-pp(23-29), Tx1-pp(1196-1204), Tx2-pp(385-388, 393-397), Rx1- pp(64)
2	L2	Transformer coupled class A audio power amplifier	BB	Tx1-pp(1198-1201), Tx2-pp(397-403) Rx2-pp(807-815)
3	L3	Second and Higher order harmonic distortion	BB	Tx1-pp(468-471)
4	L4	Efficiency of class A amplifiers – Class B amplifier	BB	Tx1-pp(1205-1209), Tx2-pp(693), Rx2-pp(**819-821)**
5	L5	Class B push–pull amplifier and efficiency Distortion in amplifiers	BB	Tx2- pp(406-409) Rx2-pp(815-819)
6	L6	Class B complementary symmetry amplifier and efficiency	BB	Tx2- pp(410-413),
7	L7	Distortion in amplifiers	BB	Tx1-pp(1224 - 1226), Tx2-pp(708),
8	L8	Class C, Class D amplifier and Class S amplifier	BB	Tx1-pp(1226 - 1229), Tx2- pp(413-417), Rx2-pp(**877-884)**
9	L9	Thermal stability and heat sink	BB	Tx1-pp(489-491)
UNIT-II FEEDBACK AMPLIFIERS				
10	L10	Introduction, Classification and Block diagram of negative feedback, Loop Gain, Gain with feedback	BB	Tx1-pp(792-794) Tx2-pp(423-426) Rx3-pp(458-466)

11	L11	Effects of negative feedback, Sensitivity and desensitivity of gain, Cut-off frequencies, distortion, noise, input impedance and output impedance with feedback	BB	Tx1-pp(795-798) Rx3-pp(466-474) Ex1-pp(727-738)
12	L12	Negative feedback topologies	BB	Tx1-pp(798-802) Rx3-pp(461-465) Ex1-pp(738-741))
13	L13	Voltage Series feedback	BB	Tx1-pp(802-810) Rx3-pp(474-481) Ex1-pp(741-744)
14	L14	Voltage Shunt feedback	BB	Tx1-pp(811-818) Rx3-pp(492-497)
15	L15	Current Series feedback	BB	Tx1-pp(818-823) Rx3-pp(482-487)
16	L16	Current Shunt feedback	BB	Tx1-pp(823-830) Rx3-pp(487-492)
17	L17	Method of identifying feedback topology and feedback factor	OHP/PPT	Rx3-pp(474-475)
18	L18	Nyquist criterion for stability of feedback amplifiers	OHP/PPT	Tx1-pp(834-845) Rx3-pp(531-535)
UNIT- III OSCILLATORS				
19	L19	Classification, Barkhausen Criterion, Mechanism for start of oscillation and stabilization of amplitude	PPT	Tx1-pp(1165-1171) Rx3-pp(543-545) Ex1-pp(780-785)
20	L20	General form of an LC oscillator	BB	Tx1-pp(1179-1182) Rx3-pp(550-553)
21	L21	Analysis of Hartley oscillator	BB	Tx1-pp(1179-1182) Rx4-pp(540-541) Ex1-pp(788-796)
22	L22	Analysis of Colpitts and Clapp oscillator	BB	Tx1-pp(517-520) Rx4-pp(539-540) Ex1-pp(796-797)
23	L23	RC oscillators: Analysis of Phase shift oscillator	BB	Rx3-pp(545-547) Rx4-pp(534-536) Ex1-pp(800-808)
24	L24	Analysis of Wein-bridge oscillator , Twin-T oscillators, Frequency range of RC and LC oscillators	BB	Rx3-pp(553-554) Rx4-pp(536) Ex1-pp(808-809)
25	L25	Quartz Crystal, Miller and Pierce Crystal oscillators, Frequency stability of oscillators	PPT	Tx1-pp(531-534) Tx1-pp(1182-1184) Rx3-pp(555-557) Ex1-pp(797-800)
26	L26	Blocking oscillator, Free running blocking Oscillator.	PPT , BB	Ex1-pp(839-840) Tx1-pp(793-708)
27	L27	Monostable blocking Oscillator with base timing and emitter timing	BB	Tx1-pp(708-733)
UNIT – IV TUNED AMPLIFIERS				
28	L28	Coil Losses, Loaded and unloaded Q of tank circuits	BB	Tx1-pp(1141-1144)
29	L29	Small signal tuned amplifiers, Analysis of capacitor coupled single tuned amplifier	BB	Ex1-pp(721-723) Tx1-pp(1114-1122)
30	L30	Double tuned amplifier	BB	Ex1-pp(724)
31	L31	Effect of cascading single tuned and double tuned amplifiers on bandwidth	BB	Tx1-pp(512-514)

32	L32	Stagger tuned amplifier	BB	Tx1-pp(1148-1152) Ex1-pp(725)
33	L33	Large signal tuned amplifier: Class C tuned amplifier	BB	Tx1-pp(516-518)
34	L34	Efficiency and applications of Class C tuned amplifier	BB	Tx1-pp(518-519)
35	L35	Stability of tuned amplifier	BB	Tx1-pp(519-521)
36	L36	Neutralization- Hazeitine Neutralization method, **Chebyshev Filters**	OHP	Tx1-pp(1095-1098)
		UNIT – V MULTIVIBRATORS AND TIMEBASE CIRCUITS		
37	L37	RC & RL Integrator and Differentiator circuits	BB	Ex1-pp(850-857)
38	L38	Diode Clippers	OHP	Rx1- pp(225 -202) Ex1-pp(857-870)
39	L39	Diode Clampers	BB, PPT	Rx1-pp(322 – 364) Ex1-pp(870-873)
40	L40	Astable multivibrator	BB, PPT	Ex1-pp(819-824)
41	L41	Monostable multivibrator	BB	Tx1-pp(1170-1171) Rx1-pp(438-451)
42	L42	Bistable multivibrator, Trigeering methods for bistable multivibrator	PPT	Tx1-pp(1160-1165) Ex1-pp(824-828)
43	L43	Schmitt trigger circuit	PPT	Rx1-pp(362-378) Ex1-pp(829-831)
44	L44	UJT sawtoothh waveform generator	BB	Tx1-pp(690-694)
45	L45	Time base circuits- Voltage-Time base circuit & Current-Time base circuit	BB	Tx1-pp(849-854) Rx1-pp(389-394) Ex1-pp(878-888)

UNIT I - LARGE SIGNAL AMPLIFIER

1. **What is power amplifier?(R)**
   The final stage in multistage amplifiers, such as audio amplifiers and radio transmitters, designed to deliver maximum power to the load, rather than maximum voltage gain, for a given percent of distortion.
2. **What are the features of power amplifier?(R)**
   - The outputs of the power amplifier are the large current and voltage.
   - The output of the power amplifier is carried out by DC equivalent and graphical method.
   - The output of the power amplifier is feed to the load.
   - The load must have the low output resistance. The output resistance is important.
   - The analysis of signal distortion in the power amplifier is important.
3. **Compare the different classes of power amplifiers. (Nov2010)(U)**

	Class A	Class B	Class C	Class AB
position of Q point	at the center of load line	at the cut off	Below cut off	just below cut off
Efficiency	25 to 50%	78.5%	above 95%	between 50 & 78.5%
Conduction angle	360°	180°	less than 180°	between 180°& 360°

4. **What are the advantages and disadvantages of different types of power amplifier?**

Types of power amplifier	Advantages	Disadvantages
Class A	Simple circuit Distortion less output	very low efficiency large power dissipation
Class B	High efficiency compared to Class A Zero power dissipation Impedance matching is possible	efficiency is not so high cross over distortion occur
Class C	Very high efficiency Low power loss	distorted output
Class AB	limitation of cross over distortion referred to Audio system	low efficiency cannot be used as audio amplifiers
Class D	High efficiency Amplify **D**igital signals	complicated design

5. **What is cross over distortion? How it can be eliminated? (Jun 2015,2016,Dec 2017) (U)**
For making transistor ON, it is necessary that V_{BE} voltage must exceed 0.7 v.Due to this, in class B amplifier while crossing over from one half cycle to other, as long as input is below 0.7v, none of the transistor is ON and output is zero. Due to this, there is distortion in the output, which is called the cross over distortion. To overcome this distortion, a small forward bias is kept applied to the transistors so that when input is zero, this additional forward bias can make the transistor ON immediately, eliminating cross-over distortion.
6. **What is meant by Harmonic distortion? Predict any two amplifiers exhibiting this effect. (Nov 2010,June 2017)(R)**
It states that the presence of those frequency component in the amplifier output which are absent in the input side of amplifier. The frequency component which has the same frequency of the input is known as the fundamental frequency component and others are known as Harmonics.
7. **Define conversion efficiency of power amplifier (Nov 2010,Jun 2015,DEC 2016) (R)**
It is a measure of the ability of an active device to convert the DC power of the supply into an AC power delivered to the load
8. **Define thermal resistance. (R)**
The temperature rise of a junction is proportional to the power dissipation. The constant of proportionality between the two is called thermal resistance. It is defined as the temperature rise per unit watt of heat dissipation. $\theta = (T_2\text{-}T_1/P_d)$ °C/W
9. **Define Amplitude distortion. (R)**
The dynamic characteristics of a transistor is nonlinear. Due to this, the output waveform will be slightly different from the AC input signal. This type of distortion is known as nonlinear or Amplitude distortion.
10. **Define Frequency Distortion. (R) (Nov 2010)**
The change in gain of the amplifier with change in the frequency of input AC signal is called frequency distortion. It takes place when various frequency component in the input signal are amplified differently
11. **Define Phase Distortion . (R) (Nov 2010)**
Phase Distortion or Delay Distortion occurs in a non-linear transistor amplifier when there is a time delay between the input signal and its appearance at the output. This time delay will increase progressively with frequency within the bandwidth of the amplifier.
12. **Why class A amplifier must not be operated under no signal conditions?(U)**
Under no signal condition, the entire d.c. power input $P_{DC} = VccI_{CQ}$, is dissipated as the heat. Thus power dissipation is maximum under no signal condition. This may increase the transistor junction temperature beyond safe value, which may lead to transistor damage. To avoid this, class A amplifier must not be operated under no signal condition.
13. **What are the advantages and disadvantages of transformer coupled class A amplifier? (R)**
Advantages :
   - The efficiency of the operation is higher than directly coupled amplifier.
   - The d.c bias current that flows through the load in case of directly coupled amplifier is stopped in case of transformer coupled.
   - The impedance matching required for maximum power transfer is possible.

Disadvantages :
   - Due to transformer, the circuit becomes bulkier, heavier and costlier compared to directly coupled circuit.
   - The circuit is complicated to design and implement compared to directly coupled circuit.
   - The frequency response of the circuit is poor.
14. **What are the advantages and disadvantages of complementary symmetry class B amplifier. (R)**
Advantages:
   - As the circuit is trasformerless, its weight, size and cost are less.
   - Due to common collector configuration, impedance matching is possible.
   - The frequency response improves due to transformer less class B amplifier circuit.

Disadvantages:
   - The circuit needs two separate voltage supplies.
   - The output is distorted to cross-over distortion.

15. Compare class B Push-pull and Complementary Symmetry amplifiers.(U)

Parameters	Push-pull	Complementary Symmetry
Types of transistors	**both** should be either p-n-p and n-p-n	**one** should be p-n-p and **other** should be n-p-n
Use of transformer	driver and output transformers are used	transformers are not needed
Configuration	both the transistors operate in **CE** configuration	both the transistors operate in **CC** configuration
Efficiency	low	high

16. What is the use of Heat Sink?(R)

Power transistors are temperature dependent devices. As they handle large currents they can be heated which leads to self-destruction. To avoid this, the transistor is fixed on a metal sheet preferably Aluminum to dissipate heat from the transistor.

17. List the advantages of class B pushpull amplifier.

1.Very low standing bias current. 2.Negligible power consumption without signal.
3.Can be used for much more powerful outputs than class A. 4.More efficient than Class A.

18. Motive the Thermal Stability.(June'17)(U)

19. Define second harmonic distortion.(June,16)(R)

20. Classify large signal amplifiers.(Dec 2017)(R)

The position of the quiescent point on the load line decides the class of operation of the power amplifier. The various classes of the power amplifiers are, 1.Class A 2. Class B 3.Class C 4.Class AB.

21. What is class D amplifier?

In order to increase the conversion efficiency, it would be desirable to make the device to operate as a switch. So that its voltage drop remains almost at minimum value over the half cycle of output current flow. Such a system is called class D amplifier.

22. State the applications of large signal amplifiers.

1.Public address systems 2.Radio receivers 3.Cathode ray tubes 4.TV receiver 5.Tape players.

<u>PART B</u>

1. Draw and explain the operation of series fed directly coupled class A power amplifier and derive its efficiency.**(Jun 2015)(U&A)**
2. For the transformer coupled class A power amplifier circuit, explain and derive the expressions for its efficiency**(Nov/Dec 2011, Jun 2015,Dec 2016,Dec 2017)(A)**
3. Draw a neat diagram of push pull class B amplifier. Explain its working and derive its efficiency **(Nov 2010/Nov 2011,June 2015,June 2016) (U&A)**
4. Draw and explain the operation of complementary-symmetry class B power amplifier and derive its efficiency. **(June 2016)(U&A)**
5. With circuit diagram, explain the operation of Class C power amplifier and derive its efficiency. **(U&A)(Dec 2016,Dec 2017)**
6. Explain about class S power amplifier.**(June 2016)(U)**
7. Give the design procedure for Heat sink.**(R)**
8. Draw a Quasi complementary-symmetry power amplifier and explain its merits.(**U**)
9. Construct the circuit diagram for class D amplifier and explain in detail.(An) **(Dec 2006)**
10. Derive the Higher order harmonic distortion with output current waveform.(**June 2016)(An)**

<u>UNIT-II FEEDBACK AMPLIFIERS</u>

PART - A

1. What is feedback?(R)

When a part of the output voltage or current of an amplifier is sampled by a suitable circuit and applied to the input so as to modify the performance and operation of the circuit, this is called feedback.

2. List the types of feedback.(U)

Broadly classifying, the feedback can be divided as positive or regenerative or direct and negative, or Degenerative or inverse. Based on the type of sampling and mixing, it can be further classified into voltage series or shunt and current series or shunt.

3. What is negative feedback? (R)

When the effect of the feedback signal on the action of the circuit is opposite to that produced by the input Signal, then the feedback is called negative, degenerative or inverse.

4. Classify negative feedback amplifiers. (Or) List the four topologies in feedback amplifiers. (May 2010, Nov 2010,DEC 2016,June 2017)

(i) Voltage series feedback (ii) Voltage shunt feedback (iii) Current series feedback (iv) Current shunt feedback.

5. What are merits of negative feedback amplifiers? (R) (May 2010 ,Jun 2009,Jun 2015)

The performance measures of negative feedback amplifiers are as follows

(i) Improved stability ii) Reduction in gain iii) Reduction in distortion and noise iv) Increase the input Impedance and bandwidth v) Decrease the output impedance

6. What is a feedback amplifier? (R)

If an amplifier output voltage or current is sampled and this sampled output is applied to the input through a two port network, the network becomes a feedback amplifier.

7. Define Feedback factor. (R) (May 2010, May 2012)

The ratio of feedback voltage to output voltage is known as feedback factor or feedback ratio.

8. Discuss the disadvantage of negative feedback.(U)

The main disadvantage of negative feedback is that it reduces the input to the amplifier which in turns reduces the output of the amplifier.

9. What are the two types of feedback? (R)

If the sampled output adds to the input of the amplifier, it is called positive or direct or regenerative feedback. A feedback is said to be negative or inverse or degenerative if the sampled output reduces the input to the amplifier.

10. Compare the amplifier gain with and without feedback.(E)

Gain of the amplifier without feedback is, $A = X_0 / X_i$, Where X_0 – Output voltage, X_i – Input Voltage

Gain of the with feedback (negative) is given as, $A_f = A/(1 + A\beta)$ Where A = amplifier gain without feedback, β= feedback gain, A_f = gain with feedback

11. Discuss the effect of feedback on noise.(An) (May 2011)

Effect of feedback on noise can be explained with the following consideration: Let A_1 and A_2 be two amplifier feedback circuit .N be the noise introduced after stage1. The output voltage can be expressed as,

$$V_0 = \frac{A_1A_2V_s}{1 + A_1A_2 2} = \frac{NA_2}{1 + A_1 A_2 2}$$

Thus the overall noise of two stage amplifier is reduced by the factor $1 + A_1A_2\beta$

12. Explain how reduction in distortion is carried out in case of feedback amplifier.(E)

Let D| be the distortion in amplifier without feedback and D be the distortion in amplifier with feedback. After amplification, the distortion is in anti phase with the original distortion voltage D and expressed as

$$\frac{D^{|} =}{1 + A\beta} \quad D$$

13. Discuss the effect of feedback on output impedance.(E)

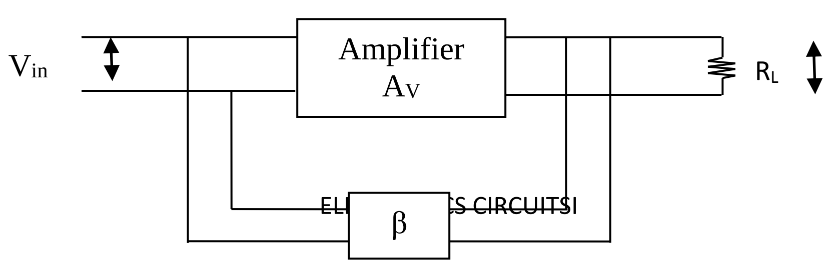
Any amplifier with low output impedance is capable of delivering power to the load without much loss and it can be easily achieved with the help of of feedback techniques. In this case, the output impedance of the feedback amplifier is given as

$$Z_{of} = \frac{Zo}{1 + A\beta}$$

14. "The gain bandwidth product of an amplifier is not altered, when negative feedback is introduced"- Justify the statement.(An) (Nov 2004)

When negative feedback is employed in an amplifier, its bandwidth increases by the same factor (1 + Aβ) by which its gain reduces .Hence the product of gain and bandwidth called gain bandwidth product remains the same.

15. Draw the block diagram of voltage feedback amplifier and give its input and output resistance. (U) (May 2005)



16. Why is positive feedback rarely used in practice?(U)

Positive feedback is rarely used in practice because it has the disadvantage of increased distortion and instability.

17. Give two examples of Voltage series feedback amplifier.(R)

The examples of voltage series feedback amplifier are (i) emitter follower (ii) source follower.

18. Distinguish between series and shunt feedback.(U)

SERIES FEEDBACK	SHUNT FEEDBACK
i)The feedback signal is connected in series with the input signal.	i) The feedback signal is connected in parallel with the input signal.
ii) It increases the input resistance.	ii) It decreases the input resistance.

19. Compare the input and output resistance of the voltage and current shunt feedback amplifiers. (E) (Nov 2008, Nov 2011)

	Input Resistance	**Output Resistance**
Voltage Shunt	$R_{if} = R_i / (1+A\beta)$	$R_{0f} = R_0 / (1+A\beta)$
Current Shunt	$R_{if} = R_i / (1+A\beta)$	$R_{0f} = R_0 .(1+A\beta)$

20. If an amplifier has the gain of 400 and feedback ratio of 0.1, find the gain with negative feedback. (A)

Negative feedback gain $Af = A / (1+A\beta)$, Given $A=400$, $\beta=0$. **(Nov 2008 , 2010, 2011,Dec 2017)**

Therefore, gain = 400 / (1+(400 X 0.1)) = 9.7

21. Define loop gain. (R) (Nov 2007)

The product of the feedback factor β and the gain of the amplifier multiplied by –1 (for negative feedback) is called loop gain or return ratio or the loop transmission feedback factor.

22. Define sampling and mixing.(R)

Sampling is the process of taking a part of output voltage or current. The process of adding or subtracting this sampled value to the input of the amplifier is called mixing.

23. Give some applications of voltage feedback.(R)

(i) Public address system, (ii) Transistor radio receivers etc..,

24. What is the effect of voltage series feedback on circuit impedance?(U) (May 2013)

The effect of voltage series feedback on circuit impedance increases the input impedance but decreases the output impedance.

25. State Nyquist stability criterion.(U) (May 2010,June 2017)

The amplifier is unstable if this curve encloses the point (-1+j0), and the amplifier is stable if the curve does not enclose this point.

26. What is phase margin?(R)

The phase margin evaluated at the frequency to where the magnitude of A(jω) β reaches unity. The phase margin is defined as the difference between the angle of A(jω) β at ω and the angle-180°.

27. What is gain margin?(R)

The stability of a feedback loop can also be assessed by examining its bode plot and evaluating one of two related parameters. One parameter called the gain margin is defined as the difference between unity and magnitude of A(jω) β at ω 180°.

28. Define sensitivity in feedback amplifiers.(R) (Nov 2010, Nov 2011,May 2011, Jun 2015,June 2016)

The fractional change in the amplification with feedback divided by the fractional change without feedback is called the sensitivity. The reciprocal of the sensitivity is called the desensitivity. $D= 1+A\beta$.

29. In a voltage amplifier, addition of negative feedback reduces its voltage gain from 300 to 60. Determine the feedback factor. (A) (May 2011)

Given $A_v = 300$, $A_{vf} = 60$

$$A_{vf} = \frac{A_v}{1+A_v\beta} \Longrightarrow 60 = \frac{300}{1+300\beta} \Longrightarrow \beta = 0.133$$

30. Calculate the Closed loop gain of a negative feedback amplifier if its open loop gain is 1,00,000 and feedback factor is 0.01. (A) (May 2012,May 2013)

$$A_{vf} = \frac{A_v}{1+A_v\beta} \Longrightarrow A_{vf} = \frac{100000}{1+100000\text{x}0.01} \Longrightarrow = 99.90$$

31.Which is the most commonly used feedback arrangement in cascaded amplifiers and why?(June 16)

Voltage series feedback is the most commonly used feedback arrangement in cascaded amplifiers. Voltage series feedback increases input resistance and decreases output resistance. Increase in input resistance reduces the loading effect of previous stage and the decrease in output resistance reduces the loading effect of amplifier itself for driving the next stage.

32.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%

D = 15/3 = 5. Where $D = 1+A\beta = 5$

A = 100.

33. A negative feedback is used to reduce the noise from an amplifier by 80%. What must be the percentage negative feedback to accomplish this if the amplifier voltage gain is 100?

Noise with feedback is $N' = N / 1+A\beta$

Decrease in noise= $N-N' /N = 1-N'/N = 1-(N/1+A\beta)/N = 1-(1/1+A\beta)$

$0.8 = 1-(1/1+100\beta)$

$0.8+80\beta = 100\beta \qquad \beta=0.04$

PART - B

1. (a) Draw the block diagram of current sampling - series mixing feedback configuration and derive an expression for transfer gain, input resistance and output resistance. (U&A) **(May 2010)**
   (b) How the negative feedback amplifier improves stability, reduces noise and increases the input impedance? (An) **(Dec 2016)**
2. (a) Identify four possible topologies of a feedback network.(A)
   (b) Identify the o/p signal & f/b signal for each topology.(A)
   (c) Identify the transfer gain & feedback factor for each topology. (A) **(May 2010)**
3. (a) Write notes on nyquist criterion.(U)
   (b) Write notes on a feedback amplifier, using a block diagram. (U) **(May 2010)**
4. With block diagram of current series feedback and derive the expression for R_{if} and R_{of}.. (U&A) **(Dec 2009)**
5. Design a two stage voltage series feedback amplifier so as to reduce the gain to 75. Assume β=0.01, Vcc=20, $h_{fe1}=h_{fe2}=100$. Draw the designed circuit. (A) **(Dec 2009)**
6. (a) Using block diagram, derive the closed loop forward transfer ratio of feedback system in terms of the open gain. (A) **(Nov 2011)**
   (b) Discuss the effect of negative feedback on the frequency response of an amplifier. (An) **(Jun 2009, May 2012, May 2013,Dec 2017)**
7. Draw the circuit of emitter follower. Identify the type of negative feedback. Calculate the gain, input and output resistance with and without feedback. (A) **(Dec 2008 , Nov 2010,Jun 2015)**
8. (a) Discuss the classification of feedback amplifiers with schematic(topology). How is impedance level modified in each type.(An) **(May 2008, May 2012,Dec 2016,June 2016)**
   (b) Derive expression for A_{vf} with positive feedback and state condition for stability in negative feedback amplifiers.(A)
9. Draw the circuit of a current series and voltage series feedback amplifier and explain. Derive expressions for input and output impedance. How does it improve the stability of the amplifier? (E) **(Dec 2007,Dec 2016,June 2016)**
10. Give the block diagram of feedback amplifier and discuss the effect of negative feedback with respect to closed loop gain, bandwidth and distortion**. (An)** **(Dec 2006)**
11. (a) Describe briefly the general characteristics of negative feedback amplifier**.(Jun 2015,June 2016,Dec 2017)(U)**
    (b) Draw the basic circuit of the voltage shunt feedback amplifier and describe the concepts involved in such an amplifier. (U) (**Dec 2005)**
12. (a) Using a block diagram, derive the expression of closed loop forward transfer ratio with positive and negative feedbacks introduced in an amplifier. (A) **(May 2005, Nov 2011, May 2012)**
    (b) List out the steps that are carried out in obtaining the complete analysis of a feedback amplifier.(U)
13. Define and explain the following types of amplifier (i) voltage amplifier (ii) Current amplifier (iii) trans-conductance amplifier (iv) trans-resistance amplifier. Derive a general expression for gain with feedback.

What is an ideal feedback amplifier? (An) **(Apr 1995)**

14. Derive the expressions for A_{vf}, R_{if}, R_{of}, R_o for voltage series feedback transistor amplifier? (A)
15. Perform the general analysis of current shunt feedback amplifier.(An)
16. Explain the general analysis of Voltage shunt feedback.(U)
17. (a) Using an example, explain voltage series feedback and analyze the circuit to determine the gain, input and output resistance.(An) **(Jun 2015)**

(b) Explain Nyquist criterion to analyze the stability of feedback amplifiers.(An) **(May 2011, May 2013,June 2016)**

18. The gain bandwidth product of an amplifier is not altered, when negative feedback is introduced. Justify the statement.(U) **(Nov 2011)**
19. For, a feedback amplifier, derive the expressions for (1) the gain with feedback (2) Lower cut off frequency (3) Upper cut off frequency. (A) **(May 2012)**
20. If an amplifier has a bandwidth of 300 kHz and a voltage gain of 100, what will be the new bandwidth and gain if 10% negative feedback is introduced? What will be the gain – bandwidth product before and after feedback? What should be the amount of feedback if the bandwidth is to be limited to 800 kHz? (A) **(May 2012)**
21. A current series feedback amplifier is shown in the figure below:It has the following parameters: R1 =20K Ω, R2=20K Ω, h_{ie} = 2 K Ω, R_L=1K Ω, R_e=100 Ω, h_{fe}=80, h_{re}=h_{oe}=0.Calculate A_v, β, R_{if} and $A_{v.f.}$ **(A)(May 2012)**
22. A negative feedback amplifier has an open loop gain of 60,000 and a closed loop gain of 300. IF the open loop upper cutoff frequency is 15KHz, Estimate the closed loop upper cutoff frequency. Also calculate the total Harmonic Distortion with feedback if there is 10% harmonic distortion without feedback. (A) **(May13)**

UNIT III OSCILLATORS

PART - A

1. Define oscillator.(R)

Any circuit which is used to generate a.c voltage without a.c input signal is called an oscillator. An amplifier with positive feedback has infinite gain and gives an a.c output without a.c input signal.

2. Mention the essential conditions satisfied by an oscillator circuit?(OR) (May 2011 , May 2010, 2012) State the Barkhausen criterion. (U) (Jun 2009 & Nov 2010, 2011,Jun 2015,2016,2017,Dec 2017)

The essential conditions for maintaining oscillations are:

1. $|A\beta|$ = 1 ,i.e the magnitude loop gain must be unity.
2. xThe total phase shift around the closed loop is zero or 360 degrees.

These conditions are commonly known as Barkhausen criterion.

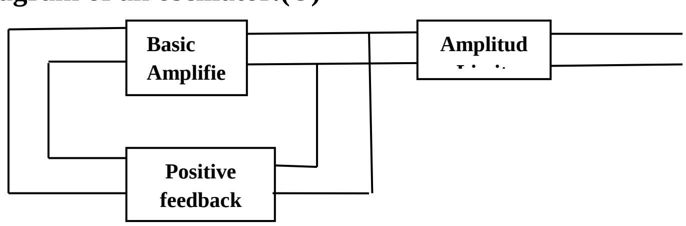
3. How are oscillators classified based on the frequency?(R) (May 2010)

(i) Audio Frequency Oscillator (ii) Radio frequency oscillator

4. What is the condition for sustained oscillation in colpitts oscillator?(R)

The condition for sustained oscillation in colpitts oscillator is given by $h_{fe} = C_2 / C_1$.

5. Give the block diagram of an oscillator.(U)



6. Write the expression for the frequency of oscillation in a phase shift oscillator.(U)

In a phase shift oscillator the frequency of oscillation is given by,

$F_r = 1 / 2\prod RC\sqrt{6}$ at frequency $|\beta| = 1/29$.

7. What are the advantages and disadvantages of RC phase shift oscillator?(R) (May 2008)

Advantages: (i) Simple circuit (ii) Produce output over audio frequency range (iii) It is fixed frequency oscillations (iii) Produces sinusoidal output waveform.

Disadvantages: (i) Change in value is not permissible (ii) Poor frequency stability .

8. Give expression for the frequency of oscillation of wien-bridge oscillator.(U) (Jun 2009)

For Wien bridge oscillator frequency of oscillation is given by $f_r = 1 / 2\pi RC$; only if $R_1 = R_2 = R$ and $C_1 = C_2 = C$.

9. Find the frequency of oscillations of a wien bridge oscillator with R1=R2=220 KΩ, c1=c2=250pF. (A) (May 2010)

For Wien bridge oscillator frequency of oscillation is given by $f_r = 1 / 2\pi RC$; only if $R_1 = R_2 = R$ and $C_1 = C_2 = C$. $f_r = 1 / 2\pi RC$, $f_r = 1 / (2\pi \times 220 \times 10^3 \times 250 \times 10^{-12}) = 2.89$ KHz.

10. In a wein bridge oscillator if the value of R is 100KΩ, and the frequency of oscillation is 10KHz find the value of capacitor C. (A) (Dec 2006, Nov 2011,Dec 2016)

$f_r = 1 / 2\pi RC$, Therfore, $C = 1/ 2\pi R f_r$, $C = 1/ (2\pi \times 100 \times 10^3 \times 10 \times 10^3) = 159$ pF

11. How will you determine the frequency of oscillation of Hartley oscillator? (E)

The frequency of oscillation of Hartley oscillator can be determined by using the equation.

$F_r = 1 / (2\pi\sqrt{(LC)})$ where $L = L_1 + L_2 + 2M$.

Where M is the coefficient of mutual inductance between coils L_1 & L_2.

12. How is frequency of oscillation expressed for colpitts oscillator?(U)

For a colpitts oscillator the frequency of oscillation is expressed as,

$F_r = 1 / (2\pi\sqrt{(LC)})$ where $C = C_1C_2 / (C_1 + C_2)$.

13. What is the condition for sustained oscillation in Hartley oscillator?(R) (Apr-96)

The condition for sustained oscillation is $h_{fe} \geq [L_1 + M] / [L_2 + M]$.Here M is the coefficient of mutual inductance.

14. In a Hartley oscillator, if L1=0.2 mH, L2=0.3 mH and c=0.003 µF. Calculate the frequency of its oscillations. (A) (May 2012)

$F_r = 1 / (2\pi\sqrt{(LC)} = 1 / (2\pi\sqrt{((0.2+0.3) X10\text{-}3 X(0.003X10\text{-}6))} = 129$ kHz.

15. Write notes on crystal oscillator.(U)

Crystal oscillator is basically a colpitts oscillator in which the inductor is replaced by the crystal. Generally a piezo-electric crystal,usually quartz is used as a resonant circuit replacing an LC circuit.

16. Give expression for f_s and f_p of crystal oscillator. (U) (May 2008)

$\mathbf{f_s} = 1 / (2\pi\sqrt{(LC)})$ and $\mathbf{f_P} = 1 / (2\pi\sqrt{(LC_{eq})})$ Where, $C_{eq} = C_MC / C_M+C$

17. Name the piezo-electric materials used for crystal oscillator.(U)

The piezo-electric materials used for crystal oscillators are quartz, tourmaline and Rochelle salt, which exhibits a property called piezo-electric effect.

18. Define piezo-electric effect. (R) (May 2010 ,May 2011)

Piezo-electric effect means the crystal reacts to any mechanical stress by producing electric charge. In converse process, it produces mechanical stress with respect to an electric field input.

19. What are the factors that affect the frequency of any oscillator?(R)(June 2017)

The factors that affect the frequency of oscillator are

1.Change in temperature
2.Variation in power supply
3.Unstable transistor parameters
4.Variation in biasing and loading condition.

20. What is the purpose for providing both positive and negative feedback in wein bridge oscillator?(R)

The positive feedback ensures sustained oscillations, a condition necessary in all oscillations. However the purpose of providing negative feedback in this of of oscillator is to ensure constant output. Any increase or decrease in the oscillator ouput is taken care of by the negative feedback.

21. Why is quartz crystal commonly used in crystal oscillators?(U)

Quartz crystal is commonly used in crystal oscillators because it is inexpensive and readily available in nature.

22. What is the main advantage of wein bridge oscillators over RC phase shift oscillators?(R)

Wein bridge oscillators is more amenable to variable frequency operation as it easier to vary two capacitors simultaneously than varying three capacitors.

23. Why are LC oscillators preferred over RC oscillators at high frequencies range in MHZ? (U)

Firstly, because L and C have reasonable values at higher frequencies and secondly because of comparatively much better frequency stability at these frequencies, LC oscillators preferred over RC oscillators.

24. How does crystal oscillator maintain frequency stability? (U) (Dec 2007 & Jun 2009)

A crystal can by shown to be high-Q resonant circuit. Due to the high Q of the crystal, the crystal oscillator is very stable or accurately fixed in value.

25. How does an oscillator differ from an amplifier as far as circuit configuration is concerned?(U)

An oscillator is an amplifier with a positive feedback in which the amount of output to be feedback is a function of the amplifier gain.

26. What is relaxation oscillator?(R)

An oscillator whose fundamental frequency of the output is determined by the time of charging or discharging the capacitor or coil through a resistor producing forms that may be rectangular or saw-tooth.

27.What is frequency stability?(R)

The ability of an oscillator to maintain the desired frequency, usually expressed as percent deviations from the assigned frequency value.

28. What is Hartley oscillator?(R)

An oscillator in which the parallel tuned tank circuit is connected between base and collector, the tank coil has an intermediate tap at emitter potential. So the base emitter portion of the coil provides at the necessary feedback voltage.

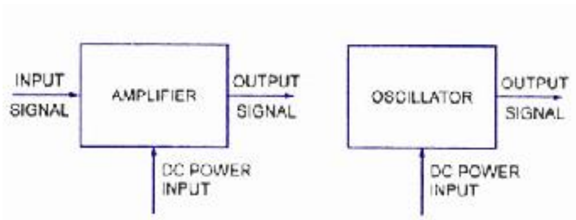
29. How is it that R-C phase shift, Wein Bridge, Hartley, Colpitts and other oscillators of their categories produce sinusoidal output?(U)

All these oscillators have a frequency selective network in the feedback path. These feedback networks satisfy Barkhausen criterion as regards loop phase-shift only at a single frequency which implies that the output will be sinusoidal.

30. Why LC tank circuit does not produce sustained oscillations. How can they overcome?(U) (Dec 2008)

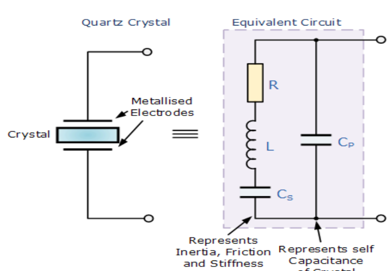
Every time when energy is transferred from C to L and L to C, the losses occur due to which amplitude of oscillating current keeps on decreasing everytime when energy takes place. Hence actually exponentially decaying oscillations will be produced. This is known as damped oscillations. The care of proper polarity is taken by feedback network. Thus LC tank circuit along with transistor amplifier can be used to obtain oscillators called LC oscillators. Due to supply of energy, the oscillations get maintained

31. What is the difference between the oscillator and amplifier?(U)



AMPLIFIER	OSCILLATOR
1.An amplifier strengthens the input signal without any change in its waveform and frequency.	1.An y circuit which is used to generate a periodic voltage without an ac input signal.
2.It needs an external signal either to start or maintain the process of energy conversion.	2. It does not need any external signal either to start or maintain the process of energy conversion.
3. Energy conversion is controlled by input signal.	3. Energy conversion is controlled by oscillator circuit itself.

32. Give the equivalent circuit of quartz crystal and mention its series and parallel resonant frequency (U) **(Dec 2010,May 2011,June 2016)**



Resistance R is used to represent internal frictional losses during vibrations, Inductance L is used to indicate the inertia and Capacitor C is used to represent the stiffness.

33. Make a table of comparison of RC phase shift oscillator and wein-bridge oscillator bringing out the similarities and differences.(U) (May 2012)

SNO.	RC PHASE SHIFT OSCILLATOR	WEINBRIDGE OSCILLATOR
1	Phase shift oscillator used for low frequency range	Phase shift oscillator used for low frequency range
2	Feedback network is RC with three RC sections	Feedback network is lead lag called wein bridge circuit
3	Feedback introduces 180° phase shift	Feedback does not introduces any phase shift
4	Op-Amp is used in inverting mode	Op-Amp is used in non -inverting mode
5	Amplifier gain condition $\|A\|\geq 29$	Amplifier gain condition $\|A\|\geq 3$

34.What is the necessary condition for a wein bridge oscillator circuit to have sustained oscillations?(U) (Jun 2015)

Gain condition $|A|\geq 3$

35. List the factors are considered to contribute change in frequency stability of oscillator.(Dec 2016)

1.Due to change in temperature, the values of the frequency determining components, such as resistor, inductor and capacitor change.2.Due to variation in the power supply, unstable transistor parameters, change in climatic conditions and aging.3. The effective resistance of the tank circuit is changed when the load is connected.4.Due to variation in biasing conditions and loading conditions.

36.Which are the two important elements of a blocking oscillator?(R)

1. Active element like transistor 2. A Pulse transformer

37. What is the function of pulse transformer in blocking oscillator?(U)

A pulse transformer is used to couple output of the transistor back to the input. The nature of such feedback through pulse transformer is controlled by relative winding polarities of a pulse transformer.

38. What are the applications of blocking oscillator?(R) (May 2008 & May 2011, May 2013,Dec 2016)

1. The blocking oscillator can be used as a frequency divider or conter. 2. The blocking oscillator as a low impedance switch can be used to discharge a capacitor quickly. 3. The output of the blocking oscillator can be used as a gating waveform with a very small mark-space ratio. 4.Blocking oscillator is capable of generating a pulse of large peak power. The average power is small since the duty cycle is low. 5. The astable circuit is used as a master oscillator to supply triggers for synchronizing a system of pulse type waveforms-square waves,sweep voltages etc., 6. The monostable circuit is used to obtain abrupt pulses from a slowly varying input triggering voltage. 7. Using a tertiary winding, output pulses of either polarity may be obtained depending upon which end of the winding is grounded. Also, the output winding may be isolated from ground where required.

39. What is the disadvantage of base timing monostable blocking oscillator?(R)

In monostable blocking oscillator, the pulse width is linear function of h_{FE} which is temperature dependent. Also its value changes from transistor to transistor and hence pulse width gets affected due to transistor replacement. This is the biggest disadvantage of the circuit and hence base timing circuit is not used if stable pulse width is required.

40.What is blocking oscillator? Why it is so called? (An) (May 2008 , May 2010, Nov 2011,Jun 2015,2016)

A tuned collector oscillator circuit which uses a regenerative (positive) feedback via a pulse transformer, producing a single pulse or pulse train is called a blocking oscillator. The oscillator cuts itself OFF or BLOCKS after one or more cycles. Hence the name Blocking oscillator.

41. Which are the two types of astable blocking oscillator? (R)

1.Diode controlled blocking oscillator 2. RC controlled blocking oscillator

2.

42. How will you form an astable blocking oscillator from a monostable blocking oscillator?(An) (Dec 2005)

A diode network can be replaced by RC network to obtain RC controlled astable blocking oscillator. Such RC network can be added either in the emitter circuit of a monostable blocking oscillator or in the base circuit of a monostable blocking oscillator.

43. Compare diode controlled and RC controlled blocking oscillator. (U) (May 2008)

Diode controlled blocking oscillator	**RC controlled blocking oscillator**
1.Low duty cycle operation is possible.	1. Low duty cycle operation is impossible
2.Time period and frequency of oscillations can be easily varied by varying R_1 or C_1	2. Time period and frequency can not be easily varied. To change time period it is necessary to change the entire diode network to alter $V\gamma$ value.
3.The oscillations just before the pulse are missing and there is much less possibility of such oscillations.	3.There is possibility of oscillations just before the pulse for low duty cycle operation
4.The design equations are simpler.	4. The equations obtained are complicated and some are transcendental which require graphical solution.
5.The circuit is easy to design.	5. The circuit is difficult to design due to complexity of the equations.
6.The timing values are temperature dependent as diode network is temperature sensitive.	6. The time values does not depend on diode which is temperature sensitive. Hence the timing values are stable and temperature independent provided $V_{BB} >> V\gamma$ of transistor and all the elements like R_1,C_1 etc., are temperature independent.
7. The overshoots after the pulse are absent and hence the waveforms are better and smooth.	7. In low duty cycle operation, voltage across capacitor discharges slowly. Due to this pulse at the collector has distorted waveform.

PART – B

1. Explain Barkhausen criterion to be satisfied for sustained oscillations. (U) **(Dec 2007)**
2. Explain RC Phase shift oscillator with neat circuit diagram. Derive its frequency of oscillation. **(NOV 2010, MAY 2012, MAY 2013,Dec 2017) (A)**
3. Design an RC phase shift oscillator to generate 5 KHz sine wave with 20V peak to peak amplitude. Draw the designed circuit. Assume hfe=150.(A) **(Dec 2009 , May 2011,Jun 2015)**
4. Derive the magnitude condition and frequency of oscillation of a wein bridge oscillator.(A) **(May 10, May 2013,June 2016)**
5. Describe the general analysis of feedback network of LC oscillator.(An) **(May 2006)**
6. Explain the working of colpitt's oscillator and derive the frequency of oscillation.(A) **(MAY 2010 ,2011, NOV 2010,2011, Dec 2016)**
7. In colpitts oscillator C1=0.001µF, C2=0.01 µF and L1=10 µH. Find the frequency of oscillation, feedback factor and voltage gain.(A) **(Dec 2009, Nov 2011, May 2013)**
8. Explain about Hartley oscillator and derive its frequency of oscillation. (An)**(Dec 2006,Jun 2015,Dec 2016,17)**
9. (a)What is piezoelectric effect? Draw and explain a.c equivalent of a crystal.(U)
   (b) Describe the crystal oscillator with neat diagram.(U) **(May 2007)**
10. With neat diagram explain the operation of Pierce crystal Oscillator. (U) **(Dec 2008)**
11. Explain the working of Miller type crystal Oscillator. Give two applications. (U) **(May 2008)**
12. With the circuit diagram derive an expression for frequency of oscillations of Clapp oscillator. Explain how Barkhausen criterion is satisfied.(An) **(Dec 2009,June 2016)**
13. With neat circuit diagrams explain the working principle of Twin-T oscillator. **(May 2012,Jun 2015,June 2016,Dec 2017)**
14. Derive the transfer function of a phase lead – lag network and hence obtain the frequency of oscillation of a wein bridge oscillator. (A) **(Nov 2011)**
15. What is the principle of oscillation of crystals sketch the equivalent circuit and impedance frequency graph of crystals and obtain series and parallel resonance frequency. Also explain how crystals are employed in oscillations for stabilization.(U) **(May 2013,Dec 2016,June 2016)**

16. A crystal has the following parameters: L=0.5H,C_s=0.06pF, C_p=1pF and R=5KΩ. Find the series and parallel resonant frequencies and Q factor of the crystal.**(Dec 2016)**.
17. With neat circuit diagram, explain monostable blocking oscillators with base and emitter timing. Draw necessary waveforms.(U) (**Dec 2009, May 2010, 2011,13,June 2016**)
18. Draw the circuit diagram and explain the operation of a Push-pull Astable blocking oscillator with emitter timing. (An) **(Jun 2010,Dec 2017)**
19. Draw the circuit of an astable blocking oscillator with base timing. Sketch the wave forms of collector voltage and magnetizing current. Explain the operation of the oscillator covering one full cycle, along with necessary equations. Sketch the equivalent circuits (1) when there is magnetizing current and (2) when the magnetizing current is zero. Also, mention the advantages and disadvantages of this oscillator. **(An) (May 2012)**
20. Explain the method of triggering the blocking oscillator using transistor.(U) **(Jun 2006)**
21. Draw the circuit diagram of a monostable transistor blocking oscillator with emitter timing. Explain its operation with the equivalent circuit during the pulse formation.
22. Explain the operation of a free running (astable) blocking oscillator.(U) **(May 2005)**
23. For a diode controlled astable transistor blocking oscillator circuit with the following parameters L =5.2mH,C=90pF,V_{cc}=10V,R=500Ω,V_r=6Vn=1 and V_{BB}=0.5V. Calculate 1. The period and duty cycle 2.Peak voltages and currents 3. Current in magnetizing inductance at the end of one cycle. Neglect saturation junction voltages.(A)(**Nov./Dec-2006**)

UNIT – IV TUNED AMPLIFIERS

PART –A

1. What is tuned amplifier? **(May 2011)**

An amplifier with tuned circuit load is known as tuned amplifier. They use a circuit that will amplify the frequency band required and reject all other unwanted signals.

2. What are the applications of tuned amplifiers? **(May 2008)**

The application of tuned amplifier is to obtain a desired frequency and to reject all frequency in radio and TV broadcasting and wireless communication system

3. What are the characteristics of an ideal circuit amplifier?

(i) It selects a single radio frequency and amplifies the same by rejecting all other frequencies.
(ii) Its bandwidth is zero. (iii) Its harmonic distortion is zero.

4. Write down the expression for the bandwidth of a tuned circuit in terms of quality factor and resonant frequency. **(May 2010)**

Resonance frequency $f_r = 1 / (2\pi\sqrt{(LC)}$ & Bandwidth = f_r / Q_L

5. A series resonant circuit has the following constants: L=220µH, C=300pF, R=20Ω. Calculate resonant frequency. **(May 2010)**

Resonance frequency $f_r = 1 / (2\pi\sqrt{(LC)}$, $f_r = 1 / (2\pi \text{ X } \sqrt{(220 \text{ X } 10^{-6} \text{ X } 300 \text{ X } 10^{-12})} = 619.5$ KHz

6. A tuned circuit has resonant frequency of 1600 kHz and bandwidth of 10kHz. What is the value of its Q-factor?

Bandwidth = f_r / Q_L ; Q = Fr/BW = $1600\text{x}10^3 / 10\text{x}10^3 = 160$

7. Determine the bandwidth of a 3 stage cascaded single tuned amplifier if the resonant frequency is 455 KHz and the loaded Q of each stage is 10. **(Jun 2009, Nov 2010, May 2011)**

$f_o = 455 \text{ X } 10^3$, Q_i =10.
$BW_n = BW_1 \sqrt{(2^{1/n} - 1)}$, $BW_1 = 455 \text{ X } 10^3 / 10 = 45.5$ KHz,
Therefore for 3 stage $BW_3 = BW_1 \sqrt{(2^{1/3} - 1)} = 45.5 \text{ X } 10^3 \text{ X } \sqrt{(2^{1/3} - 1)} = 23.2$ KHz.

8. State the reason for instability in tuned amplifier. **(May 2010)**

If the reactance of the collector to base capacitance (C_{bc}) at RF is low enough it provides the feedback path from collector to base. With this circuit condition, if some feedback signal manages to reach the input from output in a positive manner. This is the reason for instability of the tuned amplifier.

9. Define Q-factor? **(May 2010,Dec 2016)**

It is defined as the ratio of maximum energy stored per cycle to that of maximum energy dissipated per cycle.

10. Define unloaded Q? (Jun 2015,Dec 2017)

It is the ratio of stored energy to the dissipated energy in a reactor or resonator.

11. What is loaded Q? (Jun 2015,Dec 2017)

The loaded Q or Q_L, of a resonator is determined by how tightly the resonator is coupled to its terminations.

12. What is double tuned amplifier?

Double tuned amplifier uses two inductively coupled tuned circuit per stage, both tuned circuits being tuned to the same frequency.

13. What are the methods to reduce instability?

a)Neutralization b) Unilateralization c) Mismatch technique

14. What are the different types of neutralization methods?

a)Hazeltine method b)Rice method c) cross method d) coil method

15. What is the need for neutralization in tuned amplifiers? (Nov 2010, Nov2011, May 2013,Jun 2015)

To prevent oscillations in tuned RF amplifiers it is necessary to reduce the stage gain to a level that ensured stability. So, to achieve this stability neutralization is needed.

16. What is meant by parasitic oscillation?

If an amplifier tends to sustain oscillation at a frequency other than the driving frequency, it is called as parasitic oscillation. It occurs due to positive feedback produced by inter electrode capacitance, load inductance, stray capacitance.

17. Why is GBW product constant?

GBW is defined as the product of the mid band gain, which is a constant and the bandwidth which is also a constant. The product of two constant should also be a constant.

18. What are the types of small signal tuned amplifier?(or) Categorize the methods of tuning. (June 2016,2017) (R)

a)single tuned b)Double tuned c)Stagger tuned

19. What is a single tuned amplifier?

An amplifier circuit that uses a single parallel tuned circuit as a load is called single tuned amplifier.

20. What are the advantages of tuned amplifiers? (May 2012)

(i)They amplify defined frequencies. (ii)Signal to noise ratio at output is good. (iii)They are suited for radio transmitters and receivers

21. What are the disadvantages of tuned amplifiers? (May 2012)

(i) The circuit is bulky and costly (ii) The design is complex. (iii) They are not suited to amplify audio frequencies.

22. What is a stagger tuned amplifier? (OR) Mention two important features of Stagger Tuned Amplifiers (Nov 2010, May 2013)

It is a circuit in which two single tuned cascaded amplifiers having certain bandwidth are taken and their resonant frequencies are adjusted that they are separated by an amount equal to the bandwidth of each stage. Since resonant frequencies are displaced it is called stagger tuned amplifier.

23. What are advantages of stagger tuned amplifier?

The advantage of stagger tuned amplifier is to have better flat, wideband characteristics.

24. What are advantages of double tuned over single tuned?

(i) Possess flatter response having steeper sides. (ii) Provides larger 3 db bandwidth (iii) Provides large gain-bandwidth product.

25. Mention the application of Class C tuned amplifier? (May 2008,June2016, 2017)

Class C tuned amplifier can be used as a mixer or frequency converter.

26. Define Gain bandwidth product of a tuned amplifier?

The gain bandwidth product of a tuned amplifier is a figure of merit defined in terms of midband gain and upper 3-db frequency as $GBW=|aim|=g_m/2\Pi c$

27. How will you classify Tuned amplifier?

a)Small signal tuned amplifier b)Large signal tuned amplifier

28. What are the factors that govern the selectivity of a single tuned amplifier?

The factors that govern the selectivity of a tuned amplifier are a)Quality factor(Q) b)Bandwidth(BW)

29. What is the effect of Q on stability?

Higher the value of Q, it provides better selectivity, but smaller bandwidth and large gain. Hence it provides less stability.

30. If the quality factor of a resonant circuit is doubled, What is the effect of bandwidth?

Quality factor is inversely proportional to the bandwidth. So when the quality factor of a resonant circuit is doubled ,the B.W is halved.

31. What is neutralization? (May 2008 , May 2011,Nov 2011, Jun 2015)

It is a phenomenon by which a signal can be transmitted from the input to the output alone and not vice-versa.

32. Briefly explain narrow band neutralization? (Jun 2009)

A process of cancelling the instability effect due to the collector to base capacitance of the transistor in tuned circuits by introducing a signal which cancels the signal coupled through the collector to base capacitance is called narrow band neutralization.

33. Compare any two performance of tuned amplifiers.(Dec 2016)

S.No	Parameter	Single tuned circuit	Double tuned circuit	Stagger tuned circuit
1	Number of tuned circuits	One	Two	More than two
2	Q factor	High	High	Moderate low
3	Selectivity	Very High	Moderate	Low
4	Bandwidth	Small	Moderate	High

34. What is the need for neutralization in tuned amplifiers?(U)(DEC2008 & NOV 2010, NOV2011)

To prevent oscillations in tuned RF amplifiers it is necessary to reduce the stage gain to a level that ensured stability. So, to achieve this stability neutralization is needed.

35.State the reason for instability in tuned amplifier. (MAY 2010)

If the reactance of the collector to base capacitance (Cbc) at RF is low enough it provides the feedback path from collector to base. With this circuit condition, if some feedback signal manages to reach the input from output in a positive manner. This is the reason for instability of the tuned amplifier.

36.What are the advantages of double tuned over single tuned Amplifier?

1. Possess flatter response having steeper sides
2. Provides larger 3 db bandwidth
3. Provides large gain-bandwidth product.

PART – B

1. Draw the circuit diagram and equivalent circuit of a capacitor-coupled single tuned amplifier and explain the frequency response derive the expression for its gain and cutoff frequency. **(May 2013, Nov 2010, May 2012,Dec 2016,Dec 2017)**
2. Derive the equation for the gain bandwidth product of a single tuned amplifier circuit. **(May 2010)**
3. A tank circuit has a capacitor of 100pF and an inductor of 150µH.The series resistance is 15Ω. Find the impedance and bandwidth of a resonant circuit. **(May 2010)**
4. With a circuit, explain the narrow band neutralization technique. **(May 2010)**
5. With circuit diagram and frequency response characteristics compare double tuned and stagger tuned amplifiers. **(Jun 2009)**
6. Draw the circuit of class C tuned amplifier and explain its operations with relevant waveforms. Discuss also its frequency response. **(May 2008, May2011, May 2012,Jun 2015,2016)**
7. Discuss the Hazeltine method of neutralization with circuit.**(May 2008, May 2011, 2012,Jun 2015,2016,Dec 2017)**
8. What is the effect of cascading single tuned amplifier on bandwidth? Derive the expression for it. **(May 13)**
9. Draw and explain the circuit of synchronous tuned amplifier with the help of frequency response.**(May 13)**
10. Draw and explain the double tuned amplifier in detail.**(Dec 2016,June 2016)**
11. Explain the stabilization technique used in tuned amplifier.
12. If class c tuned amplifier has R_L=6k and required tank circuit Q=80.Calculate the values of L & C of the tank circuit. Assume Vcc=20V ,Resonant frequency=5MHZ and worst case power.
13. A single tuned amplifier is designed with following values.f_r=500KHZ,BW=25KHZ.The total output resistance R_t=18K and C=35Pf.Find the L&C of the tuned circuit.
14. A single tuned RF amplifier has tank circuit of 47pF capacitance & a series combination of 1 µH inductance and 22ohm resistance. The values of R_0=48K and C_0=10pf.If R_i of the next stage is 18K. Find all relevant parameters.
15. The BW of a single tuned amplifier is 25KHZ.Calculate the BW if such three stages are cascaded. Also calculate the BW for 4 stages.

16. (a) Briefly explain the principle of Stagger tuning. **(May 2011,Jun 2015)**
(b) Discuss the effect of bandwidth on cascading single tuned amplifiers.
17. A single tuned transistor amplifier is used to amplify modulated RF carrier of 600 kHz and bandwidth of 15kHz. The citcuit has total output resistance R_t = 20kΩ and output capacitance C_0=50 pF. Calculate the values of inductance and capacitance of tuned circuit. **(May 2012)**
18. Obtain the bandwidth of a n stage cascaded identical single tuned amplifiers in terms of the bandwidth of a single-stage tuned amplifier.
19. Derive the expression for Q factor of the capacitor.**(Dec 2016)**
20. Design a tuned amplifier using FET to have f_o=1 MHz, 3dB bandwidth=10 KHz and maximum gain= -10. Assume g_m=5mA/V, r_d=10 KΩ.**(Dec 2016)**

UNIT – V WAVE SHAPING AND MULTIVIBRATOR CIRCUITS

PART – A

1. What is linear wave shaping?(R)

The process by which the shape of a nonsinusoidal signal is changed by passing the signal through the network consisting of linear elements is called linear wave shaping**.**

2. What is high pass RC circuit?(or)What is a differentiator? Explain its feature and use.(R)

A circuit which consists of a series capacitor and a shunt resistor is called a differentiating or high pass RC circuit. At very high frequencies, the capacitor acts as a short circuit and all the higher frequency components appear at the output with less attenuation than the lower frequency components. Hence this circuit is called high- pass filter. Due to this feature, it is used as coupling circuit to provide dc isolation between input and output.

3. What is low pass RC circuit? (or)What is an integrator? Explain its feature and use.(R)

A circuit which consists of a series resistor and a shunt capacitor is called an integrator or low pass RC circuit. At very high frequencies, the capacitor acts as a virtual short circuit and the output falls to zero. Hence this circuit is called low - pass filter. Due to this feature, it is used when it is required to extend the range of operation of some electronic circuit to a higher frequency.

4. What is tilt or sag? Give its expression.(U)

The decay in the amplitude of the output voltage waveform when the input level is maintained constant is called tilt or sag or decay.

$$P = \frac{V - V'}{V} \times 100 = \frac{t_1}{R_1 C_1} \times 100\%$$

5. Define Duty cycle.(R)

It is the ratio of the ON period (T_{ON}) to the total period (T = T_{ON} + T_{OFF}).Therefore duty cycle = T_{ON} / T.

6. Define Rise time.(R)

It is the time required by the output response to rise from 10% to 90% of its maximum value.

7. Define Delay time.(R)

In a transistor switching circuit, the collector current(output response) does not immediately respond to the input pulse. There is a delay and the time that elapses during this delay together with time needed for the current to rise to 10% of its maximum(saturation) value ie., $I_{C(Sat)}$= V_{CC}/R_C is called the delay time.

8. Define Fall time.(R)

It is the time required by the output response to fall from 90% to 10% of its maximum value.

9. Define storage time. (R)

When the input signal returns back to its initial state at t = T, the collector current gain fails to respond immediately. The interval which elapses between the transition of the input voltage waveform and the time when collector current (i_c) dropped to 90% of its maximum value is called the storage time.

10. Define speedup capacitor. (R)

Speedup capacitors or commutating, transpose capacitors are small capacitors introduced in shunt with the coupling resistors of the binary of a switching circuit in order to reduce the transition time. Since these capacitors assist the binary in making abrupt transition between starter, they are known as speedup capacitors.

11. What is clipper circuit? (R)

The circuit with which the waveform is shaped by removing (or clipping) a portion of the input signal without distorting the remaining part of the alternating waveform is called a clipper. Clippers are also called as limiters, amplitude selectors or slicers.

12. What are the types of clippers? (R)

1.Positive Clipper 2.Negative Clipper 3.Biased Clipper 4.Combination Clipper

13. What are the uses of clippers? (R)

Clippers are used in radars, digital computers, radio and television receivers.

14. What is a Clamper? What are its uses? (R) **(Nov2011, May 2012)**

A clamper is a circuit which shifts (clamps) a signal to a different dc level, ie., it introduces a dc level to an ac signal. The clamper is also known as dc restorer. It is used in television receivers to restore the dc reference signal to the video signal.

15. What are the types of Clampers? (R)

1. Positive clamper 2. Negative clamper

16. Define Multivibrator. (R)

A multivibrator is a two stage switching circuits in which the output of the first stage is fed to the input of the second stage and vice-versa. The outputs of two stages are complementary.

17. What is bistable multivibrator? (R)

A bistable multivibrator has two stable states. The multivibrator can exist indefinitely in either of the two stable states. It requires an external trigger pulse to change from one stable state to another.The circuit remains in one stable state unless an external trigger pulse is applied.The bistable multivibrator is also referred as flip-flop, Eccles-Jordon circuit,trigger circuit or binary.

18. State the basic action of monostable multivibrator. (U) **(Apr 2003)**

Monostable multivibrator is also known as one-shot multivibrator or univibrator. It has one stable state and one quasi-stable state. When an external trigger pulse is applied to the circuit, the circuit goes into the quasi-stable state from its normal stable state. After some time interval, the circuit automatically returns to its stable state.The circuit does not require any external pulse to change from quasi-stable state to stable state.The time interval for which the circuit remains in the quasi-stable state is determined by the circuit components and can be designed as per the requirement.

19. What is Astable multivibrator? (R) **(Nov 2010)**

An astable or free-running multivibrator generates square wave without any external triggering pulse. It has no stable states, ie., it has two quasi-stable states. It switches back and forth from one state to the other, remaining in each state for a time depending upon the discharging of a capacitive circuit.

23. Where are bistable multivibrator applied? or State the applications of bistable multivibrator ?

a)Memory element in shift register, counters and so on. **(R) (Jun 2007 , May 2011)**

b)To generate square wave of symmetrical shape by sending regular triggering pulse to the input.

c)It is used as a frequency divider.

20. What are the applications of Astable multivibrator?(R) (Dec 2016)

1. Used as square wave generator, voltage to frequency converter 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.Used in the construction of digital voltmeters and SMPS.4.Can be operated as an oscillator over a wide range of audio and radio frequencies.

21. What are the applications of Monostable multivibrator?(R) **(Dec-2007,Dec 2016)**

1. It is used to function as an adjustable pulse width generator.
2. It is used to generate uniform width pulses from a variable width input pulse train.

22. What is meant by triggering of multivibrator? (R)

To provide proper pulse input to achieve a transistion from one state to the other state of the multivibrator, is called the triggering of multivibrators.

23. What is meant by unsymmetrical triggering?(U) **(Nov-2005)**

This method uses two triggering inputs. The triggering signal from the first input is applied to set the circuit in one particular state. The triggering signal from the second input is applied to reset the circuit to the opposite state. This process is called set-reset triggering. The unsymmetrical triggering is used in register and oding circuits.

24. What is meant by symmetrical triggering? (R)

In symmetrical triggering method, each successive triggering signal changes the state of the flip-flop. It is used in binary counting circuits.

25. What is the frequency of oscillation of astable multivibrator?(U) **(Nov-2005)**

Time period=T=1.4RC , Frequency of oscillation=1/T=1/1.4RC

26. What are applications of Schmitt trigger? (R) (Dec 2007 , Nov 2010, May 2012)

a) It is used for wave shaping circuits and as a voltage comparator

b) It is used for the generation of rectangular waveform with sharp edges from a sine wave or any other waveform

c) It can be used as a voltage comparator.

d) Triggering can be made more sensitive to small noise fluctuations present in the input signal

27. Define Schmitt trigger (or) What is mean by regenerative comparator?. Give an Example Circuit. (R) (Jun 2006, May 2013)

Schmitt trigger is a wave shaping circuit, used for generation of a square from a sine wave input. It is a bistable circuit in which two transistor switches are connected regeneratively.

28.Define UTP and LTP. (R)

UTP is a point at which the transistor enters into conduction state i.e. from OFF to ON state. LTP is a point at which the transistor enters from ON to OFF state.

29.What is hysteresis voltage and hysteresis in Schmitt trigger? (R)

The difference between UTP and LTP is known as hysteresis voltage(V_H). V_H is also known as Dead zone of the Schmitt Trigger. The lagging of the lower threshold voltage from the upper threshold voltage is known as hysteresis.

30. What is the difference between an oscillator and multivibrator?(U)

Multivibrator operates in non linear region of transfer characteristics and oscillator operates in linear or active region of its transfer characteristics.

31. Compare the transistors used in multivibrator circuits with those that are used in conventional amplifiers.(U) (Dec 2004)

In the multivibrators, the transition of transistor states from ON to OFF and OFF to ON is important. To avoid the distortion, this transistion must be as fast as possible.Hence the transistors used in multivibrators have small switching times ie.,small turn on and turn off times as compared to those used in conventional circuits. Such transistors are called switching transistors.

32. State the role of commutating capacitors in Bistable multivibrator.(U) (Jun 2009)

In bistable multivibrator,trigger is required to change the state. The time required to change the state is called the transistion time.The speed-up capacitors are used to reduce the transition time without affecting the stable states.These capacitots allow fast rise and fall times and avoids the distortion in the output.

33. State the expression for gate width of monostable multivibrator.(E) (Jun 2009)

$$T = \tau \ln(2)$$

The time constant τ for the charging path of capacitor C is RC, So,T=0.69RC.Thus the gate width is independent of transistor characteristics,supply voltage and resistance value.

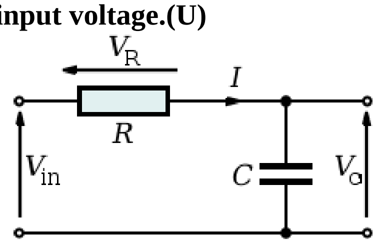
34. Define quasi stable state. (R) (May 2010)

The stable state of monostable multivibrator in which circuit remains for some time and returns to stable state,is called Quasi stable state

35. Differentiate clippers from clampers. (U) (May2010)

CLIPPERS	CLAMPERS
The circuit with which the waveform is shaped by removing (or clipping) a portion of the input signal without distorting the remaining part of the alternating waveform is called a clipper	A clamper is a circuit which shifts (clamps) a signal to a different dc level, ie., it introduces a dc level to an ac signal.

36. Draw the circuit of an integrator using Rand C as circuit elements and find its output voltage V0, if Vi is the input voltage.(U) (May 2011)



$V_0 = 1/RC \int V_i \, dt$

$V_0 = V_i [1 - e^{-t/RC}]$

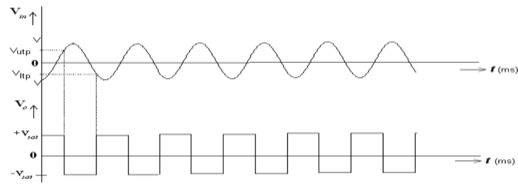
37. Why is monostable multivibrator is called delay circuit? (E) (May 2011)

The time between the trasistion from quasi –stable state to stable state can be pre determined and hence I can be used to introduce time delays with the help of fast transition. Due to this application, it is called as delay circuit.

38. What is self biased multivibrator? (U) **(May2011)**

If the multivibrator automatically makes the successive transitions from one quasi – stable state to other without any external triggering pulse., then it is known as self-biased multivibrator. Ex: Astable Multivibrator.

39. Sketch the output waveform of a Schmitt trigger circuit for sine wave input of 12v peak-to-peak if UTP=5v and LTP=3v.(U) (Nov 2011,Dec 2017)



40. What is UJT relaxation oscillator?(R) (May 2010)

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.

41.What is mark space ratio? (R)

The ratio of time for which Q is ON to time for which Q is OFF is called mark space ratio**.** If this is unity, then the output is almost symmetrical square wave.

42. Define Duty cycle. (R)

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

43. What do you mean by linear time base generator? (R) (Jun 2007)

A linear time base generator is one that provides an output waveform, a portion of which exhibits a linear variation of voltage or current with time.

44. What do you mean by voltage time base generators? (R)

Circuits used to generate a linear variation of voltage with time are called voltage time base generators.

45. What are the applications of the voltage time base generators? (R)

1. In cathode ray oscilloscope 2.In radar 3.In television indicators 4.In precise time measurements and 5. In time modulation

46. Define Restoration time or Flyback time. (R) (Jun 2009, May 2012)

The time required for the return for the sweep voltage to the initial value is called the restoration time, the return time or fly back time.

47. Define sweep time. (R) (Dec 2008, Jun 2009, May 2012)

The period during which voltage increases linearly is called sweep time.

48. List important sweep parameters.(U)

Important sweep parameters are: sweep speed error, displacement error and transmission error.

49. Name the different errors in generation of sweep waveforms.(U)

Different errors in generation of sweep waveforms are: sweep speed error, displacement error and transmission error.

50. Define sweep speed error or slope error. (R) (Jun 2006, May 2013)

It is the ratio of difference in slope at beginning and end of sweep to the initial value of slope.

51. Define displacement error. (R) (Jun 2006,May 2011, May 2013)

It is defined as the maximum difference between the actual sweep voltage and linear sweep which passes through the beginning and end points of the actual sweep.

52. Define transmission error. (R) (May 2004)

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

53. Give the expression for sweep voltage for exponential sweep circuit.(U)

$V_s = V (1-e^{-t/RC})$

54. Give the expression for displacement error.(U)

$$e_d = \frac{(v_s - v_s')_{max}}{V_s} = \frac{T_s}{8RC}$$

55. Give the expression for sweep speed error.(U)

$$e_s = \frac{\text{Difference in slope at beginning and end of sweep}}{\text{initial value of slope}} = \frac{T_s}{RC}$$

56. Give the expression for transmission error.(U)

$$e_t = \frac{Vs' - Vs}{Vs} = \frac{Ts}{2Rc}$$

57. Give the expression for sweep speed for exponential charging.(U)

$$\frac{dVs}{dt} = \frac{t}{RC} e^{-t/RC}$$

58.. Define sweep speed. (R)

The sweep speed is defined as the rate of change of sweep voltage with respect to time.

59. Give the expression for sweep speed for constant current charging.(U)

$$\frac{dv_s}{dt} = \frac{I}{C}$$

60. Give the expression for relation between transmission error, sweep speed error and displacement error.(U)

$$e_d = \frac{1}{8} \quad e_s = \frac{1}{4} \quad e_t$$

61.List various sweep circuits. Or What are the various methods of generating a time base waveform? (U) (May 2008)

1.Exponential charging circuit 2.Constsnt-current charging circuit 3.Miller circuit 4.Phantastron circuit 5.Bootstrap circuit 6.Inductor circuit 7. Compensating networks.

62. What are current time base generator? (R) (Dec 2005)

Current time base generator are the circuits which produce a current waveform which increases linearly with time. They are used in magnetic deflection system as television displays on large screen tubes and radars.

63. What are the drawbacks of time base generator? How can it be reduced? (U) (Dec 2008)

The main drawback of time base generator is the high percentage slope speed error. It can be reduced by improving the linearity of the sweep by increasing the supply voltage or increasing the time constant of the circuit.

64. How can you suppress the transformer oscillation?(U)

In order to suppress the transformer oscillation without loading the blocking oscillator during the pulse interval a damping resistor R in series with a diode may be shunted across the transformer. The diode is introduced with such a polarity that it does not conduct during the pulse interval, but does conduct during the overshoot.

65. Give the uses of time base generator. (R) (May 2011)

It is used in deflection plates of CRO to sweep the electron beam from left to right. It is also used in TV.

66. What is the principle used in bootstrap circuit?(U)

Bootstrap generator provides a very linear output ramp. The amplitude of the ramp can approach the level of the supply voltage. The output ramp amplitude can be made adjustable over a fixed time period by making resistor adjustable.

67. What are the methods used to improve the linearity of the sweep circuits? (R)

a)By generating an impulse b)By improving the linearity of current divider for yoke.
c)By linearization of trapezoidal voltage

68. What is a sweep generator? (R) (May 2010)

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.,

69. What do you mean by free running blocking oscillator?Why they are called so?(U) (Jun 2010)

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. There are two types of astable blocking oscillators available:1.Diode controlled astable blocking oscillator 2.RC controlled astable blocking oscillator.

70. Write the equation used to determine sweep frequency of a UJT relaxation oscillator. Calculate the frequency with R = 100 KΩ, C = 0.4 μF and intrinsic stand-off ratio 0.57. (A) (Dec 2007)

$$\text{Sweep frequency} = \frac{1}{2.3RC\log_{10}(1/1-\eta)} = 29.6$$

71. The transistor current sweep circuit will not provide precisely linear sweep. Why?(An) (Dec 2006)

1. Lag of impulse term in current source 2.The inductance of iron core varies with current. 3. The driver transistor which provides the inductor current does not operate with sufficient linearity.

72. An RC low pass Circuit has R = 1.5K ohm, C = 0.2 uF, what is the rise time of the output when Excited by a step input.(A) (May 2013)

$t= 0.1\ RC = 0.1x1.5x10^{3}x0.2x10^{-6} = 0.03msec$

PART – B

1. With necessary waveforms and circuit diagram explain the method of generating a linear sweep voltage using Bootstrap circuit. (U) (**Dec 2008, Dec 2009, June 2009**)

2.Define slope, displacement and transmission errors with reference to a sweep signal. (R) (**May 205**)

3. Define the errors that are used to measure the deviation from linearity of a sweep signal.(R) (May 2005)

4. With a neat circuit diagram and relevant waveforms, explain the performance of a triggered transistor (May 2008)

5. With suitable circuit diagrams, explain the following 1.UJT sawtooth generator 2.Miller sawtooth generator (U) (May 2008, May 2010, May 2012,Dec 2016)

6. A uni-junction transistor with η = .62(intrinsic stand-off ratio) is used in a relaxation oscillator circuit with R = 5 KΩ and C = 0.05 μF. 1.Determine the period and frequency of oscillation 2.Determine the new value of R, which must be changed in order to obtain a frequency of oscillation of 50Hz. 3. If C is increased by a factor of 10, how the value of R changes,if the frequency is to be 50Hz. (A) (**Dec 2006**)

7. Explain with circuit diagram and waveforms the voltage time base generator. **(U)**

8. Draw the circuit of a simple current time base generator. Explain the working of the circuit with associated waveforms.(U) (**Dec-2007, Nov 2010,May 2013)**

9. For a certain UJT sweep circuit, the resistance is 10 kΩ while the capacitance is 0.1 μF. The valley potential is 1.5V when V_{BB} = 20 V. Assuming diode cutin voltage of 0.7 V and intrinsic stand off ratio as 0.6, calculate the frequency of oscillations. **(A)**

10. How high pass RC circuit be used as a differentiator?(U&An) (**May 2006**)

11. How low pass RC circuit be used as a integrator? (U&An) (**Dec 2004**)

12. Define and illustrate the following nonsinusoidal waveforms:1.Step 2.Pulse 3.Square 4.Ramp(U)

13 .Derive and draw the response of high pass and low pass RC circuit to following waveforms(U & An) 1. Step 2.Pulse 3.Square 4.Ramp (**Jun 2006, May 2012**)

14. Derive and draw the response of high pass and low pass RL circuit to following waveforms: (A) 1.Step 2.Pulse 3.Square 4.Ramp

15. With circuit diagram and waveforms explain the operation of RC circuits as Integrators and Differentiators for square wave input.(U)

16. Explain how RC circuits are used as integrators and differentiators. Sketch the output for a square wave input.(U)

17. Draw the circuit diagram of an emitter-coupled monostable multivibrator and explain its operation with relevant waveforms. (U & An) (**Jun 2006**)

18. Explain the unsymmetrical triggering and symmetrical triggering of bistable multivibrator. (U)(**Dec2007,Dec 2017**)

19. Draw the circuit diagram of an emitter coupled astable multivibrator.(U) **(Dec-2009,Dec 2016,June 2016)**
20. Design a monostable multivibrator for the following specifications: V_{CC} = 10 V,V_{BB} = 6 V, $I_{C(on)}$ = 1 mA, duration of output pulse = 14 seconds,h_{FEmin} = 100, I_{CBO} = 0,$V_{BE(off)}$ = -0.5V.(A)
21. Design a Schmitt trigger circuit for V_{CC} = 10 V, UTP = 5V, LTP = 3V. Assume h_{FEmin} = 100 and $I_{C(on)}$ = 1 mA. (A)
22. Design a collector coupled astable multivibrator for the following specifications: Output voltage 10V peak, $I_{C(on)}$ =1 mA, h_{FEmin} = 100, I_{CBO} = 0, output to be a positive pulse, the duration of which is 20μsec,the time between pulses to be 10 μsec. (A) (**May 2004)**
23. With circuit diagram and waveforms explain the operation of a Schmitt trigger using two transistors for a sinusoidal input. (U) (**May 2010, 2011 & Nov 2010, May 2012,Jun 2015,Dec 2016,June 2016**)
24. With circuit diagram and necessary waveforms, explain the operation of a saturated collector coupled astable multivibrator.(U) (**Dec 2008,May 2013,Jun 2015**)
25. With circuit diagram and necessary waveforms, explain the operation of a saturated collector coupled monostable multivibrator. (U) (**Dec 2008**)
26. Explain the effect of emitter coupling in monostable multivibrator. (U) (**Jun 2006**)
27. Explain the ON and OFF state of the transistors in a collector coupled symmetrical triggered Bistable multivibrator.(U) (**Jun 2006)**
28. Explain the effect of speed up capacitor in bistable multivibrator. (An) (**Jun 2006)**
29. Determine the value of capacitors to be used in an astable multivibrator to provide a train of pulse 2μs wide at a repetition rate of 100KHz if R_1=R_2=20KΩ. (A) (**Jun 2009, May 2012,Dec 2017**)
30. Explain circuits used to trigger a transistor monostable multivibrator circuit .(U) (**Dec 2008)**
31. Describe the parallel biased clipper operation with necessary diagrams.(U) (**May 2010)**
32. Design and draw a saturated collector coupled monostable multivibrator for the following specifications: Vcc=10V, Vbb=5V, pulse duration=12ms, Ic=2mA and hfe=100.(A) **(May 2011)**
33. A 10 Hz symmetrical square wave, with a peak to peak amplitude of 2 V, is impressed upon a high pass RC circuit whose 3-dB frequency is 5 Hz. Calculate and sketch the output waveform. What is the peak to peak output amplitude?(A) **(May 2012)**
34. (1) With a Circuit diagram and wave forms explain the working a positive and negative clamping circuits
    (2) Draw the circuit to perform the following 1. To transmit that part of the sine wave that lies between -3 V & + 6V. 2. To clip the input sine wave below -4 volt.(U) **(May 2013,June 2016)**
35. With a Circuit diagram and wave forms explain the working a positive clipper circuits.(U)**(May 2013, Jun 2015)**

KSR COLLEGE OF ENGINEERING
Department of ECE
Electronic Circuits/16EC412
Cycle Test–1
Part A (5*2 = 10)

1. Define Power Amplifier.(R)
2. What is thermal resistance? (R)
3. Distinguish between Voltage and Power Amplifier.(R)
4. How crossover distortion is eliminated in push pull amplifier?(U)
5. How Efficiency is improved in transformer coupled Class A power Amplifier?(U)

Part – B

6. Explain the RC Coupled Class A power Amplifier with suitable circuit diagram an derive the necessary equations of power relations?(A)(8)
7. Explain the working of Class B Push pull Amplifier.(U)(7)

Cycle Test–2
Part A (5*2 = 10)

1. Classify negative feedback amplifiers.(U)
2. "The gain bandwidth product of an amplifier is not altered, when negative feedback is introduced"- Justify the statement.(An)
3. Define loop gain. (R)
4. Define sensitivity in feedback amplifiers.(R)
5. Calculate the Closed loop gain of a negative feedback amplifier if its open loop gain is 1,00,000 and feedback factor is 0.01. (A)

Part – B

6. Describe briefly the general characteristics of negative feedback amplifier.(U)(8)
7. Draw the circuit of a current series feedback amplifier and explain. Derive expressions for input and output impedance. How does it improve the stability of the amplifier? (A)(7)

Cycle Test–3
Part A (5*2 = 10)

1. Write the essential condition for oscillator.(R)
2. Compare RC phase shift and Wein bridge Oscillator.(U)
3. Define piezo-electric effect. (R)
4. Define Frequency stability.(R)
5. What are the applications of blocking oscillator?(R)

Part – B

6. Derive the frequency and gain relations of weinbridge oscillator.(A) (8)
7. Derive the frequency and oscillatory condition for Hartley oscillator. (A)(7)

Assignment-I

Part A (5*2 = 10)

1. What is tuned amplifier? What are the applications of tuned amplifiers?(R)
2. Determine the bandwidth of a 3 stage cascaded single tuned amplifier if the resonant frequency is 455KHz and the loaded Q of each stage is 10.(App)
3. Define unloaded Q and loaded Q.(U)
4. What is the need for neutralization in tuned amplifiers?(An)
5. Mention two important features of Stagger Tuned Amplifiers.(R)

Part – B

6. Draw the circuit diagram and equivalent circuit of a capacitor-coupled single tuned amplifier and explain the frequency response derive the expression for its gain and cutoff frequency.(An)(8)
7. What is the effect of cascading single tuned amplifier on bandwidth? Derive the expression for it.(An)(7)

Assignment-II

Part A (5*2 = 10)

1. What is high pass RC circuit?(R)
2. What are the applications of Astable multivibrator?(R)
3. Define Schmitt trigger .(R)
4. Differentiate clippers from clampers.(U)
5. Sketch the output waveform of a Schmitt trigger circuit for sine wave input of 12v peak-to-peak if UTP=5v and LTP=3v.(An)

Part – B

6. Derive and draw the response of high pass and low pass RC circuit to following waveforms(U & An) (8)
   1. Step 2.Pulse 3.Square 4.Ramp
7. Draw the circuit diagram of an emitter coupled astable multivibrator.(U)(7)