MARIA COLLEGE OF ENGINEERING AND TECHNOLOGY, ATTOOR

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC CIRCUITS-II

2 MARKS QUESTIONS & ANSWERS

UNIT-1

Feedback Amplifiers

1. What is meant by feedback?

The process of combining a fraction or part of output energy back to the input is known as feedback.

2. What are the types of feedback?

The different types of feedback are:

1. Positive feedback.

2. Negative feedback.

3. What is meant by positive feedback?

If feedback signal applied is in phase with the input signal and thus increases the input, it is called as positive feedback. it is also known as regenerative feedback.

4. What is meant by negative feedback?

If the feedback signal applied to the input is out of phase with the input signal and thus signal decrease, it is called negative feedback. It is also known as degenerative feedback.

5. How are the amplifiers classified based on the input and output.

The amplifier is basically classified into four types based on the input given and output obtained. They are

1).Voltage amplifier.

2). Current amplifier.

3).Transconductance amplifier.

4).Transresistance amplifier.

6. What are the effects of negative feedback? (or) What are the advantages of negative feedback?

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.

7. What are the classifications of feedback amplifiers?

1. Current series feedback.

2. Current shunt feedback.

3. Voltage series feedback

4. Voltage shunt feedback

8. Define the feedback factor β?

It is the ratio between the feedback voltages to the output voltage of the amplifier.

$$\beta = V_f / V_o$$

Where

β is a feedback factor (or) feedback ratio.

V_f is the feedback voltage.

V_o is the output voltage.

9. Define Desensitivity ?

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.

10. What is current-series feedback amplifier. (or) transconductance amplifier?

In a current series feedback amplifier the sampled signal is a current and the feedback signal (Which is fed in series)is a voltage.

$Gm = I_o / Vi$

Where

Gm = Amplifier gain.

I_o = Output current.

Ii = Input current.

11. what is voltage series feedback amplifier? (or) What is voltage amplifier?

In a voltage series feedback amplifier the sampled signal is a voltage and feedback signal(Which is fed in series) is also a voltage.

$A = V_o / Vi$

Where

A = Amplifier gain.

V_o = Output voltage.

Vi = Input voltage.

12. What is Voltage shunt feedback? (or)

What is transresistance amplifier?.

In voltage shunt feedback amplifier the sampled signal is a voltage and the feedback signal(Which is fed in shunt)is a current.

$Rm = V_o / Ii$ (or) $V_o = Rm. Ii$

Where

Rm = Amplifier gain.

V_o = Output voltage.

Ii = Input current.

13. What is current -shunt feedback amplifier?

In a current shunt feedback amplifier, the sampled signal is a current and the feedback signal(Which is fed in shunt) is a current.

$A = I_o / Ii$ (or) $I_o = A\ Ii$.

Where

A = Amplifier gain.

I_o = Output current.

Ii = Input current.

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

For positive feedback:

$Af = A / (1-A\ \beta)$

For negative feedback:

$Af = A / (1+A\ \beta)$

Where,

Af = Amplifier gain with feedback.

A = Amplifier gain without feedback.

β = Feedback factor.

15. Give an example for current-series feedback amplifier..

The common emitter amplifier with Re in the emitter lead and FET common source amplifier stage with source resistor R are the best expel for current series feedback circuit.

16. Distinguish between series and shunt feedback amplifiers.

Series feedback:

(i). In series feedback amplifier the feedback signal is connected in series with the input signal.

(ii). It increases the input resistance.

Shunt feedback:

(i). In shunt feedback amplifier the feedback signal is connected in shunt with the input signal.

(ii). It decreases the input resistance.

17. What is the nature of input and output resistance in negative feedback.

(1). Voltage series feedback:

Input impedance:

$$Z_{if} = Z_i / (1+A\ \beta)$$

Output impedance:

$$Z_{of} = Z_o / (1+A\ \beta)$$

(2). Voltage shunt feedback:

Input impedance:

$$R_{if} = R_i * (1+A\ \beta)$$

Output impedance:

$$Zo_f = Zo * (1+ A\ \beta)$$

(3). Current series feedback:

Input impedance:

$$R_{if} = Z_i / (1+A\ \beta)$$

Output impedance:

$$Z_{of} = Z_o / (1+A\ \beta)$$

(4). Current shunt feedback:

Input impedance:

$$R_{if} = R_i / (1+A\ \beta)$$

Output impedance:

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

PART-B

1. Draw the circuit diagram of voltage series feedback amplifier using BJT and analyse the circuit to determine the input and output resistance.

2. Discuss qualitatively on the effect of topology of a feedback amplifier upon output resistance. Also obtain the expression for output resistance for all four topologies.

3. Draw the circuit of an emitter follower. Identify the type of negative feedback. Calculate the gain, input and output resistance with and without feedback.

4. Compare the four types of feedback topologies with respect to basic amplifier, R_{if} and $R_{of.}$ Draw example circuit for each type of feedback.

Unit II

Oscillators

Part-A

1. State the Barknawen criterion for an oscillator

a) The total phase shift around the loop, (ie) the signal process from input through amplifier,

feedback network back to input again is 0^0 or 360^0

b) The magnitude of the product of the open loop gain of the amplifier (A) and the feedback

factor B is unity i.e /AB/=1

2. Give the classification of the oscillators

a) Sinutoidal oscillators b) Non Inuodeal oscillators

Based on ciruit components

a) RC oscillators b) LC oscillators c) crystal oscillators

Based on feedback signal used or not

a) feedback amplifier b) Non feedback amplifier

Based on the rang of operating freq.

a) Audio frequency OSC b) Radio frequency OSC c) Very high frequency OSC

d) Ultra high frequency OSC e) Microwave frequency OSC

3. State the expression for the frequency of operation of Hartley oscillator is

$$F = \frac{1}{2\pi \sqrt{LeqC}}$$

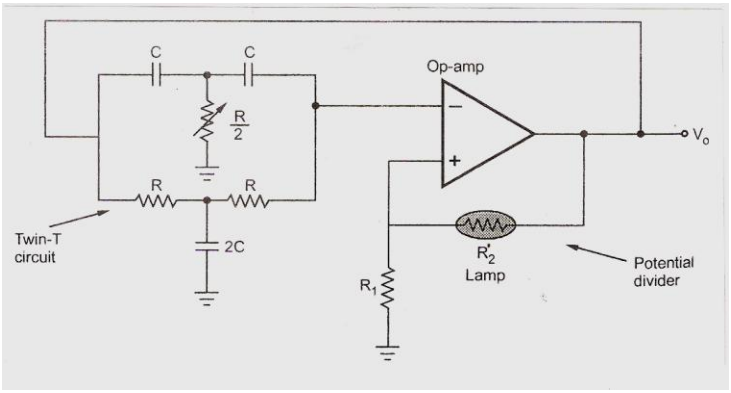
Where Leq = L1 +L2

4. State the advantages of clap oscillator

a) The frequency is state and accurate

b) Desired frequency can be achieved by using the variable capacitor C_3

5. Draw the circuit of a Twin –T oscillator



6. Define piezo electric effect

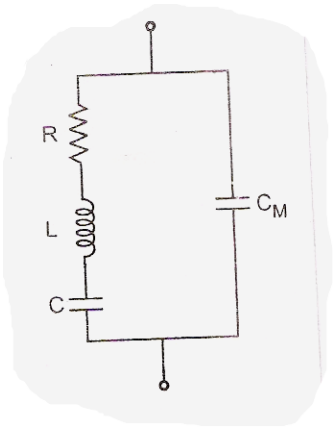
The crystals exhibits piezo electric effect. Ie) under the influence get generated across the

opposite faces of the crystal is called piezo electric effect

7. What are the advantages of crystal oscillator

The crystal oscillator has a greater stability in holding the constant frequency. Hence they are used in watches, communication transmitters receivers etc.

8. Give the equivalent circuit of quartz crystal and mention its series and parallel resonance Frequency.



Series resonance frequency $F_s = \frac{1}{2\pi\sqrt{LC}}$

Parallel resonance frequency $F_s = \frac{1}{2\pi\sqrt{LC_{eq}}}$

Where $C_{eq} = \frac{CM}{C}$

CM +C

9. What are the advantages and disadvantages of RC phase shift oscillator.

Advantages:

a) The circuit is simple to clesign
b) Produces sinusoidal O/P wave forms
c) Produce O/P over audio freq range.

Disadvantage:

a) Freq of oscillation can be changed by changing the values of R and C. But the of R and C of all the three sections has to change to satisfy oscillation condition.
b) Freq stability of C

10. A wien bridge oscillator is used for operation at 10 Khz. It the value of the resistance is 100 Icohrs n, what is the value of C?

$$F = \frac{1}{2\pi RC}$$

$$10 \times 10^3 = \frac{1}{2\pi \times 100 \times 10^3 \times C}$$

C = 159.155 PF.

11. What is frequency stability of a oscillator?

The measure of ability of an oscillator to maintain the desired frequency as precisely as possible for a long time as possible is called frequency stability of an oscillators.

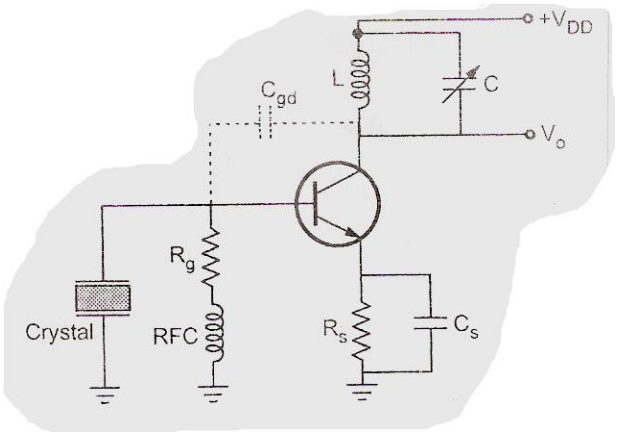
12. How frequency stability can be improved in a oscillator circuit?

a) Enclosing the circuit in a constant temperature chamber

b) maintaining constant voltage by using the zener abodes

c) Load effect is reduced by coupling the oscillator to the load loosely or with help of a circuit having high i/p impedance and low o/p impedance.

13. Draw the Millers oscillator circuit



14. Why a LC tank circuit does not produce sustained oscillations. How can this be overcome?

The overall gain of the circuit must be increased. So as overcome the losses of the circuit and circuit will start circuit.

15. It C1 and C2 are 200PF and 50PF respectively calculate the value of inductance for producing oscillations at 1MHz in the culprits oscillator circuit.

C1= 200PF , C2=50PF , F=1MHz

$$Ceq = \frac{C_1 C_2}{C_1 + C_2} = \frac{200\times10^{-12} \times 50\times10^{-12}}{(200 + 50)\times10^{-12}} = 40\ Pf$$

$$F = = \frac{1}{2\pi\sqrt{LCeq}}$$

$$1\ 10^{6} = \frac{1}{2\pi \sqrt{L \times 40 \times 10^{-12}}}$$

L = 0.6332mH

16. If L1 = 1mH, L2 = 2mH and C=0.1 Inf, what Re frequency of oscillation of the Hartley Oscillator

$$F = \frac{1}{2\pi \sqrt{C(L1 + L2)}}$$

$$= \frac{1}{2\pi \sqrt{0.1 \times 10^{-9}\ (1\ \times 10^{-3}\ + 2 \times 10^{-3}}}$$

= 290.575 1cHz

17. Calculate the frequency of oscillation for the clap oscillator with C1 = 0.1μPF, C2 = 1μF, C3 = 100PF, and L=470 μH.

Solu:

C1 = 0.1μPF, C2 = 1μF, C3 = 100PF, and L=470 μH.

$$\frac{1}{Ceq} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}$$

$$= \frac{1}{0.1\times10^{-6}} + \frac{1}{0.1\times10^{-6}} + \frac{1}{0.1\times10^{-12}}$$

$= \quad Ceq = 99.89\ pF$

$$= \frac{1}{2\pi\sqrt{LCeq}} = \frac{1}{2\pi\sqrt{470\times 10^{-6}\times 99.89\times 10^{-12}}}$$

$= 734.53Khz$

18. State the comparison on RC Phase shift and wien bridge oscillator

RC phase shift OSC	**Wien bridge OSC**
1. The feedback network is RC network with three CR section 2. The feedback network introduces 18^0 phase shift 3. The feq of oscillation is $F = \frac{1}{2\pi RC\sqrt{6}}$ 4. The amplifier gain condition is $/A/ \geq 29$	The feedback network is lead-lag network which is called wien bridge phase The feedback network does not introduce any phase shift The feq of oscillation is $F = \frac{1}{2\pi RC}$ The amplifier gain condition is $/A/ \geq 3$

19. What is oscillator?

With out an input, the output will continue to oscillate whose frequency depends upon the feedback network or the amplifier or both is called an oscillator.

20. Define positive feedback?

When the phase of the feedback signal is fame OY that the i/l applied, then the feed back is called positive feed back.

Part-B

1) Explain colpitts oscillator and derive its frequency of oscillation?
2) Explain the working Draw the circuit diagram and explain the working of Horetly oscillator. Also derive the expression for frequency of oscillation and condition for sustained oscillation.
3) Explain the working of RC phase shift oscillator and derive the expression for frequency of oscillation.
4) Draw the circuit of when bridge oscillator . Derive the transfer function B(w) of the phase lead – lag network used and hence explain how barkhausen conditions are statistical in this RC oscillator.

UNIT-III

TUNED AMPLIFIERS

PART-B

1. What is meant by unloaded and loaded Q of tank circuit?

Unloaded Q is the ratio of stored energy to dissipated energy in a reactor or resonator. The loaded Q is determined by how tightly the resonator is coupled to its terminations.

2. Mention the applications of class C tuned amplifiers?

Tuned amplifiers are used as a mixer or frequency converter circuit .i.e.-it is used to translate signal frequency to some lower frequency or to some higher frequency. When it is used

to translate signal to lower frequency it is called down converter. When it is used to translate signal to higher frequency, it Is called up converter.

3. What is narrow band neutralization?

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.

4. List various types of tuned amplifiers?

a) Single tuned amplifier.

b) Doubled tuned amplifier.

c) Stagger tuned amplifier.

d) synchronously tuned amplifier.

5. Define Q factor?

The Q factor is the ratio of reactance to resistance .The Q factor can also be defined as the measure of efficiency with which inductor can store the energy.

6. What are the various components of coil losses?

a) Copper loss

b) Eddy current loss.

c) Hysteresis loss

7. What do you mean by tuned amplifiers?

The amplifiers which amplifiers only selected range of frequencies with the help of tuned circuits are called tuned amplifiers.

8. What is dissipation factor?

The dissipation factor is the total loss with in a component and is referred as 1/Q.

Where Q->Quality factor

9. What are the advantages of double tuned amplifier?

In double tuned amplifiers, the tuning is done both at the primary and secondary.

The double tuned amplifiers provide a wider bandwidth, flatter pass band and a greater selectivity.

10. Indicate how coil neutralization technique is implemented in turned amplifiers?

The neutralization can be implemented in tuned amplifiers by feding back a portion of the output signal to the input in such a way that it has the same amplitude as the unwanted feedback with opposite phase.

11. A tuned amplifier has its maximum gain at a frequency of 2Mhz and has a bandwidth of 50 kh z. Calculate Q factor.

Given Fr=2mhz, Bw=50 Khz

Q=Fr/Bw=2*10^6/50*10^3 =40

12. Brief the relation between bandwidth and Q factor.

The Quality Factor determines the 3db bandwidth for a resonate circuit.

The 3 db bandwidth of a resonate circuit is given

B.W=Fr/Q

Where,

Fr→ Centre frequency

B.W→ Bandwidth

If Q is large, Bandwidth is small.

13. Mention two applications of tuned amplifiers

a) Tuned amplifiers are used in radio receivers to amplify a particular band of frequencies for which the radio receiver is used.

b) Tuned class B and class C amplifiers are used as output RF amplifiers in radio transmitters to increase the output efficiency and to reduce the harmonics.

14. What Is the need for neutralization in tuned amplifier?

Tuned amplifiers in the frequency very near to unit gain Bandwidth, the inter junction capacitance between the base and collector become dominant.

In this condition there is some possibility for the input signal to reach the input from output in a positive manner with proper phase shift. Thus the circuit will work as an oscillator by stop working as an amplifier. This effect can be overcome by neutralization.

15. Where is the Q point placed in class C type amplifier?

The amplifier is said to be class C, if the Q point and the input signal are selected in such away that, the output signal is obtained for less than a full input cycle.

16. Define gain Bandwidth product of a tuned amplifier?

The gain Bandwidth of a tuned amplifier is designed as a product of 3dB Bandwidth and the gain at response of the tuned amplifier.

17. State the advantages of tuned amplifiers.

a) They amplify defined frequencies

b) Signal to noise ratio at output is good

c) The band of frequencies over which amplification is required can be varied.

18. What is the difference between single tuned and synchronously tuned amplifiers?

Single tuned amplifier	Synchronously
a)It contains only one tuned circuit.	Several identical stages of tuned amplifiers can connected in cascade and tuned to the same frequency.
b).Bandwidth = BW	Bandwidth = BW $\sqrt{2^{1/n}-1}$

19. Give the expression for the efficiency of class C tuned amplifiers

Efficinecy =(Pout/Vcc*Idc)100%

20. What is a synchronously tuned amplifier?

When tuned amplifiers are cascaded if all the amplifier stages are identical and Tuned to same frequency f_o then it is called as synchronously tuned amplifier. This results in a increased in gain and reduction in bandwidth.

PART-B

1. Draw the circuit diagram of a single tuned amplifier and obtain expression for its gain.

2. Explain class C tuned amplifier and derive its efficiency

3. a) Describe any one method of neutralization used in tuned amplifiers
   b) Explain briefly about stagger tuned amplifier

4. Draw the circuit diagram of a double tuned amplifier and obtain the expression for its gain

UNIT –lV

WAVE SHAPING & MULTIVIBRAIOR CIRCUITS

1) Compare the transistor used in multivibrator circuits with those that are used in conventional amplifiers?

The transistors used in multivibrators must have transistion time as small as possible. Their Ton and Toff must be small. These transistors are high speed transistors.

2) State the roll of commutating capacitors in Bistable multivibrator.

The commutating capacitor is also called as speed up capacitor. Because of this capacitor in Bistable multivibrator the transition time reduces considerably with out affecting the stable states. That is it allows fast rise and fall time.

3) Distinguish between symmetric triggering and unsymmetric triggering methods?

The unsymmetric triggering use two inputs to change the state of bistable multivibrator, where as in symmetric triggering only one trigger input is applied to the input of any one transistor

4) Why is Monostable multivibrator also called as delay circuit?

In Monostable multivibrator the time between the transitions from quasi stable state to the stable state can be predetermined and hence it can be used to introduce time delay with the help of fast transitions.

5) Describe a simple clamper circuit.

The circuits which are used to add a d.c level as per the requirement to the a.c output signal is called clamper circuit.

a) Positive clamper
b) Negative clamper

6) Describe a simple clipper circuit.

The circuits which are used to clip off the unwanted portion of the waveform without distorting the remaining part of the waveform are called clipper circuit.

7. State the applications of Schmitt trigger.

a) Used as a amplitude comparator

b) used as squaring circuit

c) Used as flip-flop in digital systems

8. What is hysteresis loop in Schmitt trigger circuit?

In Schmitt trigger the output changes its state from low to high at UTP, it remains there till input crosses LTP and vice versa. This characteristic of Schmitt trigger is called hysteresis. The loop of this characteristic is called hysteresis loop.

9. What is meant by Schmitt trigger?

In a circuit which converts sine wave into a square wave. It also has two opposite operating states as in all multivibrator. In this case the triggering signal is a slowly Varying a.c voltage.

10. What is a linear waveform-shaping circuit?

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.

11. Define integrator.

Integrator is a circuit that passes low frequencies of the input and attenuates high frequencies. Integrator implies that the output voltage is an integral of the input voltage.

12. What is meant by multivibrator?

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

13. List the types of multivibrator.

I. Astable multivibrator

II. Bistable multivibrator.

III. Monostable multivibrator.

14. Define Astable multivibrator.

Astable multivibrator is a multivibrator in which neither state is stable. There are two temporary states. The circuit changes state continuously from one quasi stables state to another at regular intervals without any triggering. This generates continuous square waveform without any external signal.

15. Define monostable multivibrator.

When a trigger pulse is applied to the input circuit, the circuit state is changed abruptly to unstable state for a predetermined time after which the circuit returned to its original stable state automatically.

16. Define the Bistable multivibrator.

Bistable multivibrator signifies a circuit which can exist indefinitely in either of two stable states and which can be induced to make an abrupt transition from one state to other by applying an external triggering signal

17. 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.

18. Define transition time.

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

19. What is meant by Schmitt trigger?

In a circuit which converts sine wave into a square wave. It also has two opposite operating states as in all multivibrator. In this case the triggering signal is a slowly varying a.c voltage.

20. Distinguish oscillator and multivibrator.

Multivibrator operates in non-linear region of transfer characteristics and

oscillator operators linear or active region of its transfer characteristics.

Part-B

1. With neat circuit diagram explain the working of monostable multivibrator. Derive its ON time. Draw the base and collector signals.

2. Draw the circuit of a collector coupled astable multivibrator. Sketch the base and collector waveform and explain the circuit operation.

3. Explain the operation of Schmitt trigger with neat circuit diagram and response of Schmitt trigger circuit for different loop gains. Also explain how hysteresis is eliminated in Schmitt trigger.

4. a. Discuss the working of self biased bistable multivibrator.
   b. explain the different methods of triggering monostable multivibrator.

UNIT-V

BLOCKING OSCILLATORS AND TIMEBASE GENERATORS:-

PART-A

1. What is blocking oscillator?

The circuit which uses a regenerative feedback, producing a single pulse or pulse Train is called a blocking oscillator.

2. Which are the two important elements of a blocking oscillator?

1. Active element like transistor.

2. A pulse transformer.

3. What is the function of pulse transformer in blocking oscillator?

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.

4. What is 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 pulses unchanged. The voltage level of the pulse can be raised or lowered by designing the proper turns ratio for the pulse transformer.

5. State the features of pulse transformer.

1. Generally iron cored and small in size.

2. The leakage inductance is minimum.

3. The interwinding capacitance is low.

4. The cores have high permeability.

5. They have high magnetizing inductance.

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. 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.

8. What is flat top response?

The portion of the response between the trailing edge and the leading edge is called flat top response.

9. 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.

10. Define the displacement error e_d of a sweep voltage.

It is defined as the maximum difference between the actual sweep voltage and linear sweep voltage which passes through the beginning and end points of the actual sweep. It is another way of specifying the linearity of a sweep waveform.

11. Mention the application of the pulse transformer.

1. To change the amplitude and impedance level of a pulse.
2. To invert the polarity of the pulse.
3. To provide dc isolation between source and a load.
4. To differentiate a pulse.
5. For coupling the stages of a pulse amplifier
6. Also used in digital signal transmission.

12. What is current time base generator?

The circuit which produces current which linearly increases with time is called current time base generator.

13. What are the application of the blocking oscillator?

a) The blocking oscillator can be used as low impedance switch used to discharge a capacitor very quickly.

b) To produce large peak power pulses, both the types of oscillators cab be used.

c) The output of the blocking oscillator can be used to produce gating waveform with very low mark space ratio.

d) It may be used as frequency divider or counter in digital circuits.

14. List varies sweep circuits?

1. Exponential charging circuit
2. Constant-current charging circuit.
3. Miller circuit
4. Boot strap circuit

5. Inductor circuit.

15. What do you mean by voltage time base generators?

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

16. What do you mean by linear time base generator?

Circuits provide an output waveform which exhibits a linear variation of voltage with time are called linear time base generators.

PART-B

1. With a neat circuit diagram and relevant waveforms, explain the performance of a triggered transistor blocking oscillator .
2. With suitable circuit diagrams , explain the following
   a. UJT sawtooth generator.
   b. MILLER sawtooth generator
3. With neat circuit diagram, explain monostable blocking oscillator with base and emitter timing. Draw necessary waveforms.
4. Explain bootstrap sawtooth generator with circuit diagram and draw output signal.