**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

Branch: ECE Subject : Analog Electronic Year : II Subject code : 1151EC103

Sem : III Faculty : Dr.S.SHIYAMALA

**UNIT -III**

1. **What is Oscillator circuit?**

A circuit which is used to generate the output signal with constant frequency and magnitude is called oscillator. It follows the positive feedback.

1. **What are the classifications of Oscillators? [Apr/May-10]**

**Based on wave generated:**

i. Sinusoidal Oscillator,

ii. Non-sinusoidal Oscillator or Relaxation Oscillator Ex: Square wave, Triangular wave, Rectangular wave etc.

**According to principle involved:**

i. Negative resistance Oscillator, ii. Feedback Oscillator.

**According to frequency generated**

i. Audio frequency oscillator 20 Hz – 20 kHz

ii. Radio frequency Oscillator 30 kHz – 30 MHz

iii. Ultrahigh frequency Oscillator 30 MHz – 3 GHz

iv. Microwave Oscillator 3 GHz – above.

Crystal Oscillators

1. **Define Barhausen Criterion. [Apr/may-10] [May/Jun-11]**
2. Total phase shift around the loop is 00 or 3600.

ii. Magnitude of the product of the gain with feedback factor is equal to unity ie │Aβ │ = 1.

An Oscillator which follows Barkhausen criterion is called the Feedback oscillator

1. **What are the conditions for oscillation? [MAY/JUN-12,11] [Nov/Dec-06,07,10,12]**

The total phase shift of an oscillator should be 3600. For feedback oscillator it should

Satisfies Barhausen criterion. [Aβ=1]

1. Total phase shift around the loop is 00 or 3600.

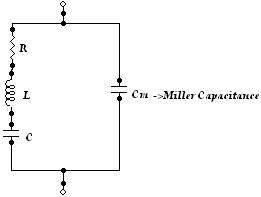
ii. Magnitude of the product of the gain with feedback factor is equal to unity ie │Aβ │ = 1.

1. **Define Piezoelectric effect. [May/Jun-06]**

Piezoelectric effect represents the characteristics that the crystal converts mechanical energy

in to electrical energy and electrical energy in to mechanical energy.

**6. Draw the equivalent circuit of crystal osci [Nov/Dec-06]**



**7.What is Miller crystal oscillator? Explain its operation.**

It is nothing but a oscillator with its feedback Network is replaced by a crystal. In between

series and parallel resonant frequency, the reactance of the crystal becomes inductive. The

crystal act as inductor and interelectrode capacitance of transistor act as capacitor to generate

oscillation.

8. **State the frequency for RC phase shift oscillator.**

The frequency of oscillation of RC-phase shift oscillator is F=1/2πRC√ (4k+6)

Where k=2.639.

**9. Why quartz crystal is commonly used in crystal oscillation? [Nov/Dec-12]**

Because of stability and accuracy quartz crystal is widely used.

**10. What are the advantages of LC oscillator and RC oscillat [May/Jun-07]**

Advantages of RC:

The circuit is simple to design.

Can produce output over audio frequency range.

Produces sinusoidal output waveform.

It is a fixed frequency oscillator.

Advantages of LC:

The frequency is stable and accurate.

The stray capacitances have no effect on C3 which decides the frequency.

Keeping C3 variable, frequency can be varied in the desired range.

**11.Define frequency drift. [Apr/May-10]**

The frequency of oscillation tends to change with time is known as frequency drift.

**12. Why crystal oscillators possess high stability?**

A major reason for the wide use of crystal oscillators is their high Q factor. The frequency

stability is determined by the crystal's Q. It is inversely dependent on the frequency, and

depends on the particular cut.

**13. What are the advantages and disadvantages of RC phase shift oscillator? Apr/May-08]**

Advantages

* The circuit is simple to design.
* Can produce output over audio frequency range.
* Produces sinusoidal output waveform.
* It is a fixed frequency oscillator.

Disadvantages:

By changing the values of R and C, the frequency of the oscillator can be changed. But the values of R and C of all three sections must be changed simultaneously to satisfy the oscillating conditions, But this is practically impossible. Hence the phase shift oscillator is considered as a fixed frequency oscillator for all practical purposes.

And the frequency stability is poor due to the changes in the values of various components due to effect of temperature, aging etc.

1. **Give the expression for fs and fp of crystal oscillator. [Apr/May-08]**

fs=

fp=

1. **What are the major advantages of Twin T oscillator? [Nov/Dec-12]**

The Twin-T oscillator works very well at one frequency

1. **How amplitude stabilization is performed in Wein bridge oscillators? [Nov/Dec-06]**

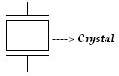
RC time constant is made much larger than the time of oscillation so the some charge is retained by the capacitor with the successive increases of amplitude, the bias increases progressively until cut off is reached, at this point the loop gain is slightly greater than unity and the amplitude of oscillation is stabilized.

1. **DifferentiateOscillators andFeedback Amplifiers.**

|  |  |  |
| --- | --- | --- |
| Parameters | FeedbackAmplifiers | Oscillators |
| Inputsignal | Needed | Notneeded |
| Typeof feedback | negative | Positive |
| Gain | Reduces | Increasesleadingto  oscillations |
| Example | Voltageseriesfeedback  amplifier | Hartleyoscillator |

1. **Define Piezoelectriceffect.**

When applying mechanical energy to some type of crystals called piezoelectric crystals the mechanical energy is converted into electrical energy and electrical energy is converted in to electrical energy which is called piezoelectriceffect.



**19. Whatis Millercrystaloscillator?Explainits operation.**

It isnothing but a HartleyoscillatoritsfeedbackNetworkis replacedbya crystal.

Crystal normallygenerate higher frequencyreactance duetothemillercapacitance are in effect between thetransistorterminal.

**20. WhatisPiercecrystal oscillator?**

Itisnothingbut a Colpittsoscillator itsfeedbackNetworkisreplaced bya crystal.

**III UNIT - 10 Mark Question**

1.(a) (i) Describe the working of a Wien-bridge oscillator. **[May/June-06] [Apr/May-10] (6)**

(ii) Analyze voltage gain, input impedance, output impedance and frequency wein bridge

oscillator. **[May/June-06][Apr/May-10] (10)**

2 (i) Describe the general analysis of feedback network of LC oscillator. **[May/June-06] (10)**

(ii) Determine the frequency of oscillation of Hartley Oscillator.  **[May/June-06] (6)**

3. (a) Explain RC phase shift oscillator with neat circuit diagram. Derive its frequency of

oscillation. Give the amplifier gain and feedback network gain to sustain oscillator operation.

**[Nov/Dec-06,08] [Nov/Dec’08] [Apr/May-10][May/June-06,12][ Apr/May-08] (16)**

4. Explain Colpitt’s and Hartley oscillator and derive their frequency of oscillation.

**[Nov/Dec-06] [May/June-06] (16)**

5. (i) Explain the need for three RC networks for the circuit functioning.**[Nov/Dec’08] (4)**

(ii) With a neat diagram, explain the operation of a transistor Pierce crystal oscillator. **(12)**

6. (i) A crystal has L = 0.33H, series capacitor 0.065 pF, parallel capacitor 1 pF and R = 5.5K

ohms. Find the series resonant frequency and Q factor of the circuit. **[Nov/Dec’08] (4)**

7. (i) With a circuit diagram, explain the principles involved in the Armstrong oscillator and Franklin, Tuned collector oscillator.**[May/Jun-12] (5+6+5)**

(ii) Describe the principles involved in the Twin-T network. **(8)**

8. (i) Draw the circuit diagram of Wien bridge oscillator and explain its working principles.

**[Apr/May-10] [May/Jun-12] [Nov/Dec-10] (8)**

(ii) Discuss briefly about the properties of quartz crystal. Draw the electrical equivalentcircuit of the crystal and explain**. (8)**

9 (i) With circuit diagram derive an expression for frequency of oscillation of a Clapp oscillator. Explain how Barhausen conditions are satisfied **[May/Jun-11] [ Nov/Dec’08 ] (12)**

(ii) Bring out the advantage of Clapp oscillator over Colpitt oscillator **[Nov/Dec’08 ] (4)**

10. Make a table of comparison RC phase shift oscillator and Wein bridge oscillator. Bringing out the similarities and differences. **[May/Jun-12] (6)**

11. Write down the factors that contribute to the change in frequency of oscillator.  **[May/Jun-11] (6)**