EL301 **Student's Copy**

2025

(NEP—2020)

(5th Semester)

ELECTRONICS (MAJOR2)

(Pulse Switching Circuits)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

Use of Simple Calculator is allowed

(SECTION : A—OBJECTIVE)

(*Marks* : 10)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. An oscillator employs _____ feedback.

(a) positive ( )

(b) negative ( )

(c) neither positive nor negative ( )

(d) Data insufficient ( )

2. The Barkhausen criterion for sustained oscillation is given by

(a) $|A|$ 1 ( )

(b) A 1 ( )

(c) $|A|$ 1 ( )

(d) A 0 ( )

3. A transistor Hartley oscillator uses

(a) resistive feedback ( )

(b) capacitive feedback ( )

(c) inductive feedback ( )

(d) No capacitor is used ( )

4. Colpitts oscillator is also known as

(a) *R-C* oscillator ( )
(b) crystal oscillator ( )
(c) piezoelectric effect ( )
(d) *L-C* oscillator ( )

5. In a phase shift oscillator, the frequency determining elements are

(a) *L* and *C* ( )
(b) *R*, *L* and *C* ( )
(c) *R* and *C* ( )
(d) *R* only ( )

6. A Wien-bridge oscillator uses _____ feedback.

(a) only positive ( )
(b) only negative ( )
(c) neither positive nor negative ( )
(d) both positive and negative ( )

7. The crystall oscillator frequency is very stable due to _____ of the cyrstal.

(a) low *Q* ( )
(b) high *Q* ( )
(c) rigidity ( )
(d) vibration ( )

8. A switch has

(a) one state ( )
(b) two states ( )
(c) three states ( )
(d) four states ( )

9. In a multivibrator, we have _____ feedback.

(a) 100% positive ( )
(b) negative ( )
(c) both positive and negative ( )
(d) neither positive nor negative ( )

10. A blocking oscillator

(a) is a triggered oscillator ( )
(b) is an amplifier with negative feedback ( )
(c) generates sinusoidal waves ( )
(d) produces sharp and narrow pulse ( )

(SECTION : B—SHORT ANSWERS)

(*Marks* : 25)

Answer *five* questions, taking at least *one* from each Unit : 5×5=25

UNIT—I

1. Discuss the essentials of transistor oscillator.

2. Explain damped and undamped oscillations from tank circuit.

3. Describe the mathematical and graphical explanation of Barkhausen criterion.

UNIT—II

4. Why is quartz crystal commonly used in crystal oscillator?

5. Why do we use three *RC* sections in *R-C* oscillator?

6. Explain the equivalent circuit of crystal.

UNIT—III

7. Discuss the advantages of an electronic switch over a mechanical or electro-mechanical switch.

8. Explain the basic difference among the three types of multivibrators.

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

(SECTION : C—DESCRIPTIVE)

(*Marks* : 40)

Answer *four* questions, taking at least *one* from each Unit : 10×4=40

UNIT—I

1. Describe the construction and working of tuned collector oscillator. Find the capacitance of the capacitor required to build an *L-C* oscillator that uses an inductance of *L* 1 mH to produce a sine wave of frequency of 1 GHz. 7+3=10

2. Describe the construction, circuit operation and feedback fraction of Colpitts oscillator. In a transistor Colpitt's oscillator, C_1 0 001 F, C_2 0 01 F and *L* 15 H. Find the operating frequency and feedback fraction. 7+3=10

3. Describe the construction, circuit operation and feedback fraction of Hartley oscillator. The frequency of a Hartley oscillator is 25 kHz. If the capacitance of the capacitor used is 450 pF, calculate the inductance. If the two series of the split inductances are in the ratio 2 : 1, calculate each inductance. 6+4=10

UNIT—II

4. Describe the construction, operation, advantages and disadvantages of phase-shift oscillator. In a phase-shift oscillator, the three networks are identical, i.e., R_1 R_2 R_3 R 1 k and C_1 C_2 C_3 C 1 pF. Calculate angular frequency of oscillations. 7+3=10

5. Describe the construction, operation, advantages and disadvantages of Wien-bridge oscillator. In the Wien-bridge oscillator, R_1 R_2 R 220 k and C_1 C_2 C 250 pF. Determine the frequency of oscillation. 7+3=10

6. What is piezoelelctric effect? Explain the frequency response of a crystal. The a.c. equivalent circuit of a crystal has the values L 1 H, C 0 01 pF, R 1000 and C_m 20 pF, calculate f_s and f_p of the crystal. 1+5+4=10

UNIT—III

7. Explain the switching action of a transistor with the help of output characteristics. A transistor is used as a switch. If V_{CC} 10 V, R_C 1 k and I_{CBO} 10 A, determine the value of V_{CE} when the transistor is *(a)* cut off and *(b)* saturated. 7+3=10

8. Describe the construction, operation, switching time and frequency of oscillation of astable multivibrator. Determine the period and frequency of oscillation for an astable multivibrator with component values R_1 2 k , R_2 20 k and C_1 0 01 F, C_2 0 05 F. 7+3=10

9. Sketch a transistor Schmitt trigger circuit and briefly explain its operation giving input-output waveforms. Explain how transistor blocking oscillator can be used to generate high current pulses of short duration. 5+5=10

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