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(CBCS)

(4th Semester)

ELECTRONICS

FOURTH PAPER

(Pulse Switching Circuits)

Full Marks : 75

Time : 3 Hours

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 10)

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

1. Closed-loop gain of a feedback amplifier is the gain obtained when

(a) its output terminals are closed ( )

(b) negative feedback is applied ( )

(c) feedback loop is closed ( )

(d) feedback factor exceeds unity ( )

2. When current negative feedback is applied to an amplifier, its output impedance

(a) is increased ( )

(b) is decreased ( )

(c) remains the same ( )

(d) is first increased and then decreased ( )

3. For sustaining oscillation in an oscillator

(a) feedback factor should be unity ( )

(b) phase shift should be 180° ( )

(c) feedback should be negative ( )

(d) No feedback ( )

4. In a transistor of Hartley oscillator

(a) no capacitor is used ( )

(b) untapped coil is used ( )

(c) entire coil is in the output circuit ( )

(d) inductive feedback is used ( )

5. Phase-shift oscillator has _____ RC section.

(a) two ( ) *(b)* three ( )

(c) four ( ) *(d)* five ( )

6. In Wien bridge oscillator, the number of transistor required is

(a) one ( ) *(b)* three ( )

(c) two ( ) *(d)* four ( )

7. The multivibrator which generates square wave of its own is the _____ multivibrator.

(a) monostable ( ) *(b)* astable ( )

(c) bistable ( ) *(d)* Schmitt trigger ( )

8. In a multivibrator, we have

(a) negative feedback ( )

(b) 100% positive feedback ( )

(c) both positive feedback and negative feedback ( )

(d) no feedback ( )

9. The binary addition 1+1+1 gives

(a) 111 ( ) *(b)* 10 ( )

(c) 110 ( ) *(d)* 11 ( )

10. In Boolean algebra, the plus sign (+) indicates

(a) OR operation ( )

(b) AND operation ( )

(c) NOR operation ( )

(d) NOT operation ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Why is feedback necessary in an amplifier? Draw a circuit diagram of negative feedback amplifier showing the components of feedback circuit.

OR

Show that the harmonic distortion voltage is reduced by application of negative feedback in an amplifier.

2. What is oscillator? Distinguish between sinusoidal and non-sinusoidal oscillators.

OR

For the Hartley oscillator, C 250 pF, L_1 1 5 mH, L_2 1 5 mH and M 0 58 mH. Determine the operating frequency.

3. Write the circuit diagram of phase-shift oscillator. Also write its advantages and disadvantages.

OR

A quartz crystal has the following parameters L 3 3 H, C 0 65 pF, R 5 5 k and C_s 10 pF. Calculate the series resonant and parallel resonant frequencies of the crystal.

4. What is the basic difference among the three types of multivibrator?

OR

What are the uses of multivibrators?

5. Find the decimal equivalent of the 6-bit binary number $(101\ 101)_2$.

OR

Subtract $(1011)_2$ from $(1101)_2$.

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* What is feedback in an amplifier? With appropriate diagrams, explain the workings of positive and negative feedback amplifiers. 1+4=5

(b) Derive the relation $A_f \quad \frac{A}{1 \quad A}$

where the symbols have their usual meanings in an amplifier. 5

OR

2. (a) Show that in a negative feedback amplifier, the gain is stabilised. 5

(b) An amplifier having a gain of 500 without feedback has an overall negative feedback applied which reduces the gain to 100. Calculate the fraction of output voltage feedback. If due to ageing of components, the gain without feedback falls by 20%, calculate the percentage fall in gain without feedback. 3+2=5

3. (a) Derive the frequency of oscillation and condition for sustained oscillation of Colpitts oscillator. 6

(b) Draw the circuit diagram of tuned collector oscillator. The tuned collector oscillator circuit used in the local oscillator of a radioreceiver makes use of an LC tuned circuit with $L_1 \quad 58 \; 6 \quad$ H and $C_1 \quad 300$ pF. Calculate the frequency of oscillations. 1+3=4

OR

4. (a) Explain the constructions and operations of series-fed and shunt-fed Hartley oscillators. 6

(b) What is undamped oscillation? Write the conditions to have continuous undamped oscillation. 1+3=4

5. (a) What is piezoelectric effect? Explain series and parallel resonant frequencies from crystal oscillator equivalent circuit. 2+4=6

(b) Explain amplitude stability and frequency stability of an oscillator. 4

OR

6. (a) With a circuit diagram, explain the operation, advantages and disadvantages of Wien bridge oscillator. 6

(b) For a tunnel diode, $L \quad 1 \; 0 \quad$ H and $C \quad 40$ pF. If the negative resistance region of the diode characteristics has a negative slope $r_d \quad 200 \quad$ and the bulk resistance of the device $R_B \quad 25 \quad$, does the circuit produce oscillations? Explain. 4

7. (a) Explain the construction, operation and switching time of astable multivibrator. 6

(b) Draw the circuit diagram of bistable multivibrator. Also write its uses. 2+2=4

OR

8. *(a)* With a neat sketch, explain the construction and operation of monostable multivibrator. 6

(b) Why is Schmitt trigger called emitter-coupled binary? Write the uses of Schmitt trigger. 2+2=4

9. *(a)* With the help of neat circuit diagram, discuss the working of AND gate. Also write its truth table. 4

(b) What is logic gate? Write the symbol and truth table of NOR gate. 3

(c) Using 1's complement method, subtract $(11011)_2$ from $(01101)_2$. 3

OR

10. *(a)* With logic circuit, obtain the truth table for half subtractor. 4

(b) Convert $(25 \cdot 625)_{10}$ into its binary equivalent. 3

(c) Multiply $(1111)_2$ by $(0111)_2$ using binary multiplication method. 3

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