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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.** If the feedback voltage is in phase with the signal voltage, then it is called

*(a)* positive feedback ( )

*(b)* negative feedback ( )

*(c)* compound feedback ( )

*(d)* series-parallel feedback ( )

**2.** The voltage gain of an amplifier is 100. If a negative feedback having 0.03, is applied, its gain will reduce to

*(a)* 3 ( )

*(b)* 70 ( )

*(c)* 95 ( )

*(d)* 25 ( )

**3.** In oscillator, the feedback back to its input terminal from the output is

*(a)* 180° out of phase with input signal ( )

*(b)* in phase with input signal ( )

*(c)* 90° out of phase with input signal ( )

*(d)* 270° ( )

**4.** In Colpitts oscillator, feedback is obtained

*(a)* by magnetic induction ( )

*(b)* by a ticker coil ( )

*(c)* from the centre of split capacitors ( )

*(d)* tapped coil ( )

**5.** If Barkhausen criterion is not fulfilled by an oscillator circuit, it will

*(a)* stop oscillating ( )

*(b)* produce damped wave continuously ( )

*(c)* become an amplifier ( )

*(d)* produce high frequency whistles ( )

**6.** The RC phase shift produced per section of an RC oscillator is

*(a)* 60° ( )

*(b)* 120° ( )

*(c)* 180° ( )

*(d)* 360° ( )

**7.** The frequency of oscillation of an astable multivibrator depends on the

*(a)* value of transistor ( )

*(b)* value of collector load resistors ( )

*(c)* RC values of the circuit ( )

*(d)* width of the input pulse ( )

**8.** A monostable multivibrator has

*(a)* no stable state ( )

*(b)* one stable state ( )

*(c)* two stable states ( )

*(d)* three stable states ( )

**9.** The digital systems usually operate on _____ system.

*(a)* binary ( )

*(b)* decimal ( )

*(c)* octal ( )

*(d)* hexadecimal ( )

**10.** The given Boolean expression is $Y \quad A\overline{B} \quad B\overline{A}$. If $A \quad 1$ and $B \quad 1$, then $Y$

*(a)* 1 ( )

*(b)* 0 ( )

*(c)* Either 1 or 0 ( )

*(d)* 11 ( )

## SECTION—B

( *Marks* : 15 )

Answer the following questions : 3×5=15

**1.** Discuss the concept of positive feedback in an amplifier.

**OR**

What do you mean by open-loop gain and closed-loop gain in a feedback amplifier?

**2.** What is oscillator? Write the mathematical and graphical explanation of Barkhausen criterion for sustained oscillation.

**OR**

A tuned collector capacitor has a fixed inductance of 100 H and is tuned over the frequency band of 500 kHz to 1500 kHz. Find the range of variable capacitor to be used.

**3.** Draw the circuit diagram of Wien bridge oscillator. Also write its advantages and disadvantages.

**OR**

For a tunnel diode, $L$ 0.01 H, $C$ 5 pF, $r_d$ 100 and $R_B$ 50 , does the circuit oscillate?

**4.** What is a multivibrator? Explain its working principle.

**OR**

Explain the switching time, frequency of oscillation and minimum values of in astable multivibrator.

**5.** Convert $0\ 8125_{10}$ into its binary equivalent.

**OR**

Use 2's complement to subtract $(1101)_2$ from $(1010)_2$.

## ( PART : B—DESCRIPTIVE )

( *Marks* : 50 )

**1.** *(a)* How does the negative feedback bring about the change in input/output impedence of an amplifier? 6

*(b)* The gain of an amplifier without feedback is 50 whereas with negative voltage feedback, it falls to 25. If due to ageing, the amplifier gain falls to 40, find the percentage reduction in stage gain *(i)* without feedback and *(ii)* with negative feedback. 4

**OR**

**2.** *(a)* What is feedback amplifier? Explain the principle of a feedback amplifier. 1+5=6

*(b)* Explain how negative feedback can increase the value of bandwidth in an amplifier. 4

**3.** *(a)* Derive the frequency of oscillations and condition for sustained oscillations in shunt fed Hartley oscillator. 6

*(b)* For the Colpitts oscillator, $C_1$ 750 pF, $C_2$ 2500 pF and $L$ 40 H. Determine the operating frequency. 4

**OR**

**4.** *(a)* Explain the construction and circuit operation of tuned collector oscillator. 6

*(b)* What are the essential components of a feedback *L-C* oscillator? Explain the positive feedback of an amplifier. 2+2=4

**5.** *(a)* With circuit diagram, explain the circuit operation, advantages and disadvantages of phase-shift oscillator. 6

*(b)* In the Wien bridge oscillator, $R_1$ $R_2$ 220 k and $C_1$ $C_2$ 250 pF. Determine the frequency of oscillations. 4

**OR**

**6.** *(a)* In negative resistance oscillator, derive the resistive cut-off frequency and self-resonant frequency. Also derive the condition for sustained oscillations. 6

*(b)* A crystal has the parameters $L$ 3H, $C$ 0 05pF, $R$ 2k and $C_s$ 10pF. Calculate the series resonant and parallel resonant frequencies of the crystal. 4

**7.** *(a)* With a neat sketch, explain the construction and working of a bistable multivibrator. 6

*(b)* In an astable multivibrator, $R_1$ $R_2$ 10K, $C_1$ $C_2$ 0 01 F and $R_{L1}$ $R_{L2}$ 1K. Find *(i)* frequency of circuit oscillation and *(ii)* minimum value of transistor . 4

**OR**

**8.** *(a)* With a neat circuit diagram, explain the construction and operation of Schmitt trigger. 6

*(b)* Draw the circuit diagram of monostable multivibrator and mention its uses. 2+2=4

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

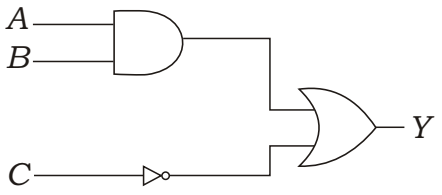
*(b)* What would be the output signal if two input binary signals given by $A$ 100101 and $B$ 110110 are applied to *(i)* OR gate and *(ii)* NAND gate? 2+2=4

*(c)* Add $(1011)_2$ and $(1001)_2$. 2

**OR**

**10.** *(a)* Write the construction and working of full adder. 6

*(b)* What is the Boolean expression for the logic diagram shown below? Evaluate its output, if $A$ 1, $B$ 1 and $C$ 1. 4

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