2017

(Pre-CBCS)

(4th Semester)

ELECTRONICS

FOURTH PAPER

(Pulse Switching Circuit)

(Revised)

Full Marks : 55

Time : 2½ hours

(PART : A – OBJECTIVE)
(*Marks* : 20)

SECTION – A
(*Marks* : 5)

Each question carries 1 mark

Put a Tick (✓) mark against the correct answer in the brackets provided :

1. Negative feedback is employed in
   (a) oscillators ( ) (b) rectifiers ( )
   (c) amplifiers ( ) (d) transducers ( )

2. In Colpitts oscillator, feedback is obtained
   (a) by magnetic induction ( )
   (b) by a tickler coil ( )
   (c) from collector of transistor ( )
   (d) from the centre of split capacitor ( )

3. A Wien bridge oscillator uses ___________ feedback(s).
   (a) only positive ( ) (b) both positive and negative ( )
   (c) zero ( ) (d) only negative ( )

4. Binary 110011_2 when added to binary 101101_2
   (a) 1100000 ( ) (b) 101110 ( )
   (c) 10110 ( ) (d) 100010 ( )

5. The frequency of oscillation of an astable multivibrator depends on the
   (a) value of transistor β ( )
   (b) value of collector load resistor ( )
   (c) RC values of the circuit ( )
   (d) width of the input pulse ( )

SECTION – II

(*Marks* : 15)

Each question carries 3 marks

Answer *any* **five** questions:

1. Write the mathematical and graphical explanation of Barkhausen criterion for sustained oscillation.
2. What is oscillator? Distinguish between damped and undamped oscillator.
3. With mathematical expression, show how noise/distortion is reduced in an amplifier with the application of negative feedback.
4. An amplifier has a voltage gain of 500 without feedback. If a negative feedback is applied, the gain is reduced to 100. Calculate the fraction of the output feedback. If, due to ageing of components, the gain without feedback falls by 20%, calculate the percentage fall in gain with feedback.
5. Define feedback of an amplifier. Differentiate between positive and negative feedback.
6. Show that the switching time (time period) of an astable multivibrator is 1.38 times the product of *R* and *C*.
7. Write the uses of Schmitt trigger.
8. Convert 0.812510 into its binary equivalent.

(PART: B – DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. *(a)* The overall gain of a multistage amplifier is 160. When negative voltage feedback is applied, the gain is reduced to 19.5. Find the fraction of the output that is feedback to the input. 2

   (b) Discuss the principles of feedback in amplifiers with a neat diagram. 5

Or

   (a) 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. 3

   (b) How does the negative feedback bring about the change in input/output impedance of an amplifier? 4

2. *(a)* Draw the circuit diagram of Colpitts oscillator. 2

(b) Explain the circuit operation of tuned collector oscillator and derive its frequency of oscillation. 2+3=5

Or

(a) A crystal has the parameters L = 3 H, C = 0.05 pF, R = 2 kΩ and C_S = 10 pF. Calculate the series resonant and parallel resonant frequencies of the crystal. 2

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

3. *(a)* In the Wien bridge oscillator, $R_1 = R_2$ = 220 kΩ and $C_1 = C_2$ = 250 pF. Determine the frequency of oscillations. 2

(b) Derive the frequency of oscillations and condition for sustained oscillations in Hartley oscillator. 5

Or

(a) For the Colpitts oscillator, C_1 = 750 pF, C_2 = 2500 pF and L = 40 μH. Determine the operating frequency. 2

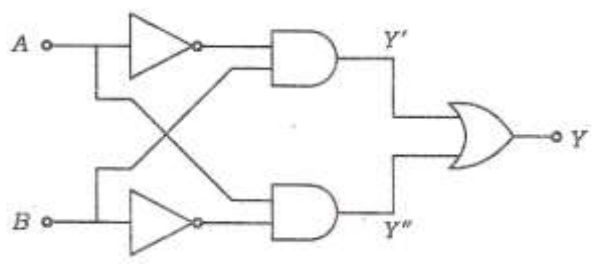
(b) Derive resistive cut-off frequency and self-resonant frequency from negative resistance equivalent circuit. 5

4. *(a)* Using 2's complement, subtract 1010_2 from 1101_2. 2

(b) Find the complement of the function 2

$$Y = A\left(\overline{BC} + BC\right)$$

(c) Give the truth table of the following logic circuit : 3



Or

(a) Divide 1110011_2 by 101_2 using binary division method. 2

(b) Multiply 1101_2 by 1100_2 using binary multiplication method. 2

(c) With block diagram, explain the working of digital voltmeter. 3

5. *(a)* Write two uses of monostable multivibrator. 2

(b) With a neat sketch, explain the working principle of bistable multivibrator. 5

Or

(a) In the astable multivibrator circuit, $R_2 = R_3 = 10\ \text{k}\Omega$, $C_1 = C_2 = 0.01\ \mu\text{F}$ and $R_1 = R_4 = 1\ \text{k}\Omega$. Find the minimum value of transistor β. 2

(b) With a neat circuit diagram, explain the working of emitter-coupled binary oscillator (Schmitt trigger). 5

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