CS-301

ANALOG AND DIGITAL ELECTRONICS

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer any *ten* questions. $10 \times 1 = 10$

(i) What is Gray equivalent of the binary 1101?

(A) 1101 (B) 1011
(C) 0111 (D) none of these

(ii) A 2-transistor class-B amplifier is usually called

(A) dual amplifier (B) inverting amplifier
(C) symmetrical amplifier (D) push-pull amplifier

(iii) The gain of an amplifier in general is

(A) imaginary (B) complex
(C) real (D) none of these

(iv) For critical modulation the value of modulation index is

(A) 0.5 (B) 1
(C) 0.75 (D) 0.1

(v) Schmitt trigger generates

(A) triangular wave (B) square wave
(C) saw tooth wave (D) none of these

(vi) A Wien bridge oscillator has a frequency

(A) $1/2\pi\sqrt{(RC)}$ (B) $1/\sqrt{(RC)}$
(C) $1/2\pi$ (RC) (D) none of these

(vii) The Q point in a voltage amplifier is selected in the middle of the active region because

(A) it gives better stability
(B) the biasing circuit then needs less number of resistors
(C) the circuit needs a small d.c. voltage
(D) it gives a distortion less output

(viii) Astable Multivibrator may be used as

(A) frequency to voltage converter
(B) squaring circuit
(C) voltage to frequency converter
(D) comparator circuit

(ix) Which one of the following is a reflected code?

(A) 8421 code (B) excess-3 code
(C) Gray code (D) ASCII code

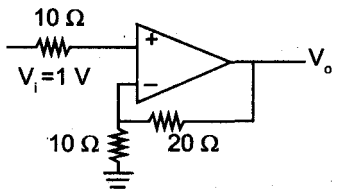
(x) The value of base X for which $(211)_X = (0.52)_8$ is

(A) 08 (B) 10
(C) 16 (D) 07

(xi) The minimum number of flip-flop require to design a MOD-10 counter is

(A) 03 (B) 10
(C) 04 (D) 05

(xii) The output voltage of the circuit



(A) 0 V (B) 1 V
(C) 2 V (D) 3 V

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. Simplify the following expression using a K-Map and realize the simplified expression using NAND gates only:

   $G(A, B, C, D) = \Sigma(1, 2, 3, 5, 6, 11,12) + d(7, 8,10,14)$

3. Implement a full adder circuit using a 3-to-8 decoder and other logic gates.

4. What is the basic principle of oscillation? What is Barkhausen criterion?

5. Implement a clocked JK flip-flop using NANO gates only.

6. What are the advantages of push-pull amplifier? Why the push-pull circuit is called so?

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) Design an asynchronous 4-bit up-down counter and it will count up when a signal line M = 0 and count down when a signal line M = 1. Use only JK flip-flops and EX-OR gates. 15

8. What is the difference between a combinational and a sequential circuit? Write down the excitation table of J-K and T flip flop. Derive their Boolean expression for the characteristic equations. What is a counter? Draw the circuit diagram and output waveform of a mod 6 ripplecounter. 15

9. A 10 stage ripple counter is constructed using individual flip flops, each having a delay of 5 ns. What is the maximum allowable frequency of the counter which will still allow correct reading? 15

10.(a) Explain the operation of a R–2R Ladder type DAC with circuit diagram. 7

(b) Explain the working of a successive approximation register type ADC. 8

11. Write short notes on any *three* of the following: 3×5

(a) Serial input parallel output shift register
(b) 8:3 encoder
(c) Parity generator
(d) Ring counter
(e) Voltage comparator using Op-Amp