MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

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. All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer any *ten* questions. 10×1 = 10

(i) A 2-transistor class *B* power amplifier is commonly called

(A) push-pull (B) dual
(C) differential (D) none of these

(ii) A stable multivibrator has

(A) no stable state (B) one stable state
(C) two stable states (D) none of these

(iii) Schmitt trigger circuit generates

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

(iv) A Wien-bridge oscillator has a frequency

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

(v) Which of the following oscillators is used at audio frequency?

(A) Crystal oscillator (B) Hartley oscillator
(C) RC phase-shift oscillator (D) Colpitts oscillator

(vi) $A + A'B + B'$ is equal to

(A) A (B) B'
(C) 1 (D) 0

(vii) Negative feedback in an amplifier is

(A) reduced gain
(B) increased noise
(C) increased frequency and phase
(D) reduced bandwidth

(viii) How many minimum number of NOR gates is required to implement NAND gate?

(A) 3 (B) 4
(C) 5 (D) 2

(ix) The digital logic family which has minimum power dissipation is

(A) TTL (B) RTL
(C) DTL (D) CMOS

(x) If the input to T-flip-flop is 100 Hz signal, the final output of the three T-flip-flops in cascade is

(A) 1000 Hz (B) 500 Hz
(C) 300 Hz (D) 12.5 Hz

(xi) Which one is the sequential circuit?

(A) Multiplexer (B) Decoder
(C) Encoder (D) Counter

(xii) 8421 is a

(A) weighted code (B) non-weighted code
(C) complementary (D) none of these

GROUP B
(Short Answer Type Questions)

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

2. Implement Full-adder circuit using two Half-adders. Write the truth table of Half-subtractor. 3+2

3. What is Multiplexer? Why it called data selector? Write the important characteristics of digital IC. 2+1+2

4. Implement the function $F(A,B,C)=\sum m(1,3,5,6)$ using decoder. What is the difference between combinational circuit and sequential circuit? 3+2

5. Draw and explain the operation of Monostable multivibrator using 555 Timer. 5

6. Draw and explain the Schmitt trigger circuit. 5

GROUP C
(Long Answer Type Questions)

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

7. (a) Write truth table, circuit diagram and timing diagram of SR flip-flop using NOR gate. 8
   (b) Convert D flip-flop into JK flip-flop. 7

8. Explain the operation of a class-B push-pull power amplifier with a neat circuit diagram. Determine its collector circuit efficiency. Explain why even harmonics are not present in push-pull amplifier. 8+4+3

9. (a) Design and implement a comparator circuit, which can compare two 3 bit binary numbers. 5
   (b) Simplify the Boolean function using Quine McClusky method. 7

$$F=\sum_{m}(1,3,4,5,9,10,11)+\sum_{d}(6,8)$$

   (c) Design a 3 bit binary parallel combined ADDER / SUBTRACTOR circuit. 3

10. What is the Barkhausen criterion for a feedback amplifier to function as an oscillator? Give a neat circuit diagram of Wien bridge oscillator and explain how it works. Find an expression for the frequency of oscillation of the astable multivibrator. 2+2+3+3+5

11. Write short notes on any *three* of the following: 3×5
   (a) Cross over distortion
   (b) Ring counter
   (c) Even parity generator and checker
   (d) 555 timer
   (e) CMOS Logic.