

International Institute of Information Technology, Hyderabad
(Deemed to be University)

EC2.101 – Digital Systems and Microcontrollers – Monsoon

Quiz 2: Set A

Max. Time: 30 min

Date: 19th October, 2023

Max. Marks: 40

**All questions have ONE correct answer. Answers to be marked on the question paper itself
+2 for correct answer, -1 for incorrect.**

NO CALCULATORS ALLOWED

Name: _____

Roll No: _____

Q1. Say we require a shift register that can perform left shift and right shift operations. How many mode select lines are required?

- ☒ a. 1 b. 2 c. 3 d. 4

Q2. A shift register A has initial value 1011. Output is fed back to input. What is the value after 1231 clock cycles?

- a. 1011 b. 1110 ☒ c. 0111 d. 1101

Q3. Say we require a sequential circuit that can detect a unique 8-bit serial information. How many flipflops does it need to have?

- a. 1 b. 2 c. 3 ☒ d. 4

Q4. A binary multiplier that can process two 16-bit inputs will have how many bit output?

- a. 17 ☒ b. 32 c. 33 d. 34

Q5. The ratio of numbers that can be represented by $4n$ -bit binary to that using BCD is:

- a. 1.6 b. $1/1.6$ ☒ c. $(1.6)^n$ d. $(1/1.6)^n$

Q6. A sequential circuit has n inputs, m D-flip-flops and k outputs. How many columns and rows (respectively) does its state table have?

- a. $n+m+k, 2^m$ b. $2^n, 2^{(m+k)}$ ☒ c. $n+2m+k, 2^{(n+m)}$ d. $n+m+k, 2^{(n+m)}$

Q7. Convert: $(1.11)_4 = ()_{10}$

- a. 1.75 ☒ b. 1.3125 c. 1.5 d. 2

Q8. What is the size of the output of a combinational circuit used as a multiplier for 3-digit BCD with 2-digit BCD number?

- a. 24-bit b. 16-bit c. 32-bit ☒ d. 20-bit

Q9. The characteristic equation of NOR SR latch is

- ☒ a. $Q(t+1) = (S + Q(t))R'$ b. $Q(t+1) = SR + Q(t)R'$
c. $Q(t+1) = S'R + Q(t)R$ d. $Q(t+1) = S'R + Q'(t)R'$

Q10. We use a shift register, with delay of 25 ns for every shift, to transmit data serially. What is the speed of communication?

- ☒ a. 40 Mbps b. 5 Mbps c. 5 Gbps d. 20 Mbps

Q11. Using a 4-bit 2's complement arithmetic, which of the following additions will result in an overflow? (i) $1100 + 1100$ (ii) $0011 + 0111$ (iii) $1111 + 0111$

- a. (i) only ☒ b. (ii) only c. (i) and (iii) d. All

Q12. What is the primary characteristic that differentiates sequential circuits from combinational circuits?

- ☒ a. Feedback b. Input variables c. Output variables d. Gates

Q13. In a synchronous sequential circuit, how are flip-flops triggered by the clock signal?

- a. On the rising edge b. On the falling edge
c. Randomly ☒ d. Depends on the design

Q14. In a sequential circuit, the number of memory elements (flip-flops) determines:

- a. The clock frequency b. The circuit's power consumption
c. The number of input variables ☒ d. The number of states the circuit can represent

Q15. What is the octal equivalent of the binary number 11001110.1010011?

- a. 355.243 ☒ b. 316.514 c. 155.511 d. 356.121

Q16. What is the decimal equivalent of the hexadecimal number CAFE?

- a. 41296 ☒ b. 51966 c. 31786 d. 59812

Q17. Which of the following combinations of logic gates can decode binary 1101?

- a. One 4-input AND gate ☒ b. One 4-input AND gate, one inverter
c. One 4-input AND gate, one 2-input OR gate d. One 4-input NAND gate

Q18. A combinational circuit is to be designed which takes a single 4-bit BCD digit as input and outputs 1 if the digit ≥ 5 , and 0 otherwise. Using only basic gates, what is the minimum number of gates required?

- a. 4 b. 6 ☒ c. 3 d. 5

Q19. Which of the following binary number is the same as its 2's complement?

- a. 1010 b. 0101 ☒ c. 1000 d. 1001

~~Q20. In the octal system, what is the result of subtracting 75 from 146?~~

- ~~a. 45 b. 71 c. 65 d. 73~~

Rough work