B.Sc. 3rd Semester (Honours) Examination, 2019-20

PHYSICS

Course ID : 32413 **Course Code : SH/PHS/303/C-7**

Course Title: Digital System and Applications

Time: 1 Hour 15 Minutes **Full Marks: 25**

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

Section-I

Answer *any five* of the following: 1×5=5

1. (a) Convert the hexadecimal number C5E2 into a binary number.

(b) Prove that $\overline{AB} + \bar{A} + AB = 1$.

(c) Explain the term 'SISO' for a shift register.

(d) "A negative logic OR gate is equivalent to a positive logic AND gate"— Justify.

(e) A device is needed to monitor the simultaneous occurrence of low states in two separate lines and to produce a high output as an indication. What will be the device?

(f) Define linear ICs with example.

(g) Write two applications of 555 timer.

(h) Substract $(12)_{10} - (21)_{10}$ using 2's complement method.

Section-II

Answer *any two* questions: 5×2=10

2. (a) What do you mean by digital comparator?

(b) With truth table and proper explanation draw the circuit diagram of a single bit comparator. 1+4=5

3. Draw the circuit diagram of MSJK flip-flop using NAND gate only. Explain how can 'race around condition' can be solved using MSJK flip-flop. What is D-flip-flop? 1+3+1=5

4. What is a Synchronous counter? What is its advantage over asynchronous counter? Draw the block diagram of a 3-bit synchronous counter and explain its operation. 1+1+3=5

5. Distinguish between OR and EX-OR gate. Why EX-OR gate is called a coincidence checker? How X-OR gate is converted into EX-NOR gate? 2+2+1=5

Section-III

Answer *any one* question: 10×1=10

6. (a) Draw a 8 word × 4 bit ROM array using decoder and diodes. Explain its operation.

(b) With block diagram of full adder and EX-OR gates, draw a circuit of 4 bit adder substractor. Explain its operation. (2+4)+4=10

7. (a) Draw a BCD to decimal decoder circuit and explain its operation.

(b) Show that $(A \oplus B) \oplus C = A \oplus (B \oplus C)$.

(c) Simplify the Boolean expression $Y = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$ using Karnaugh Map.

4+3+3=10
