2024/07

SET A

B.Sc. PHYSICS
THIRD SEMESTER
DIGITAL SYSTEMS & APPLICATIONS
BSP – 303 OLD COURSE [SPECIAL REPEAT]
[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. The binary addition 1+1+1 gives
   a. 111 b. 10
   c. 110 d. 11

2. The number 1000_2 is equivalent to decimal number
   a. One thousand b. Eight
   c. Four d. Sixteen

3. The only function of a NOT gate is to
   a. Stop a signal b. Re-complement a signal
   c. Invert an input signal d. Act as a universal gate

4. A NOR gate is ON only when all its inputs are
   a. ON b. Positive
   c. High d. OFF

5. An S-R latch is a
   a. Combinational circuit b. Synchronous circuit
   c. One bit memory element d. One clock delay element

6. In a sequential circuit the output state depends upon
   a. Past output states and present input states b. Input states only
   c. Input and output states d. None of these

7. According to the algebra of logic, $(A + \bar{A})$ equals
   a. A b. 1
   c. 0 d. $\overline{A\bar{A}}$

8. The expression $\overline{A\bar{B}C}$ can be simplified to
   a. $\bar{A} \bullet \bar{B} \bullet \bar{C}$ b. AB+ BC+CA
   c. $AB + \bar{C}$ d. $\bar{A} + \bar{B} + \bar{C}$

9. D-Flip flop can be configured from a
   a. J-K Flip flop and an inverter b. R-S Flip flop
   c. R-S Flip flop and an inverter d. J-K Flip flop

10. Boolean algebra is essentially based on
    a. Symbols
    b. Logic
    c. Truths
    d. Numbers

11. The frequency of oscillation of an astable multi-vibrator depends mainly on the
    a. Value of collector load resistor
    b. RC value of the circuit
    c. Value of transistor β
    d. Width of the input pulse

12. First integrated circuit chip was developed by
    a. C.V. Raman
    b. W.H. Brattain
    c. J.S. Kilby
    d. Robert Noyce

13. An integrated circuit is
    a. A complicated circuit
    b. An integrated device
    c. Much costlier than a single transistor
    d. Fabricated on a tiny silicon chip

14. Most important advantage of an IC is its
    a. Easy replacement in case of circuit failure
    b. Extremely high reliability
    c. Reduced cost
    d. Low power consumption

15. A microprocessor is ALU
    a. And control unit on a single chip
    b. And memory on a single chip
    c. Register unit and I/O device on a single chip
    d. Register unit and control unit on a single chip

16. The signal to be viewed on the screen of an oscilloscope is applied
    a. Across its X-Plate
    b. Across its Y- Plate
    c. To the horizontal amplifier
    d. To the triggered circuit

17. The digital system usually operates on _____system.
    a. Binary
    b. Decimal
    c. Octal
    d. Hexadecimal

18. A logic gate is an electronic circuit which
    a. Makes logic decision
    b. Allows electron flow only in one direction
    c. Works on binary algebra
    d. Alternates between 0 and 1 values

19. According to the Absorptive Laws of Boolean algebra, expression (A+AB) equals
    a. A
    b. B
    c. AB
    d. A • A

20. The time period of IC-555 mono-stable multivibrator operation is
    a. 1.38 RC
    b. 1.1 RC
    c. 1.45 RC
    d. 13.8 RC

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Descriptive

Time: 2 hrs. 30 min. Marks: 50

[Answer question no.1 & any four (4) from the rest]

1. What is the advantage of J-K Flip flop over S-R Flip flop? How is an S-R Flip flop converted to J-K Flip flop? Write the truth table for J-K flip flop and convert it to characteristics table and excitation table. **2+4+4 =10**

2. **a.** What is a binary coded decimal? Write the following numbers in BCD code : 157, 2498 and 673. **4+3+3 =10**

   b. Write the steps involved in 2's complement subtraction. Use 2's complement to subtract 1010_2 from 1101_2.

   c. Find the decimal equivalent of the following binary numbers: 101, 1001 and 10.011.

3. **a.** Draw the equivalent diode relay circuit of an AND gate and explain the operation. **4+4+2 =10**

   b. Sketch the symbol and construct the truth table for XOR and NAND gates.

   c. Draw a logic circuit for the Boolean expression
   $y = \bar{A} \cdot B \cdot C + (A + B) \cdot C$

4. **a.** Using the truth table, prove that $A + \bar{A}B = A + B$ and illustrate the equivalence with the help of a switching circuit. **4+2+4 =10**

   b. Simplify the Boolean expression
   $AB\bar{C} + AB\bar{C} + \bar{A}BC + ABC + A\bar{B}C$

   c. Prove the Boolean identity $(A+B)(A+C) = A+BC$

5. **a.** Draw the block diagram, write the truth table for a hexadecimal to binary Encoder and implement it using logic gate. **6+4=10**

b. Construct a 8×1 MUX using a 4×1 MUX.

6. **a.** With the help of a neat and labeled diagram explain the working of an astable multi-vibrator. **8+2 =10**

b. The components of IC-555 Timer astable multi-vibrator is given as: RA=7.5 kΩ, RB= 7.5 kΩ, C= 0.1μF, VCC= 5 V. Determine the frequency.

7. **a.** Mention the advantages of ICs. **5+5=10**

b. Differentiate between Linear ICs and Digital ICs.

8. Draw the block diagram of the 8085A Microprocessor. Explain its organization and operation. **5+5=10**

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