April 2025
B.A./B.Sc.
Fourth Semester
CORE – 10
PHYSICS
Course Code: PHC 4.31
(Digital Systems & Applications)

Total Mark: 70   *Pass Mark: 28*
Time: 3 hours

Answer <u>five</u> questions, taking <u>one</u> from each unit.

UNIT–I

1.　(a)　Discuss XOR gate with necessary circuit diagram and write its truth table.   5
　　(b)　What is parity checker? Explain how XNOR gate is used as odd parity checker.   1+4=5
　　(c)　Explain the operation of OR gate using a transistor.   4

2.　(a)　Write a short note on emitter coupled logic circuit.   6
　　(b)　(i)　Convert 110101 to decimal number.   1
　　　　(ii)　Convert 95.5 to hexadecimal number.   1
　　(c)　Illustrate how a NAND gate can be used to design a AND, OR and NOT gate.   3
　　(d)　What is an integrated circuit (IC)? List some of the advantages of IC.   1+2=3
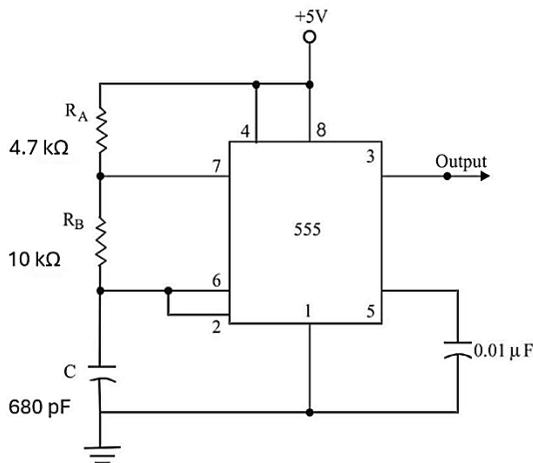
UNIT–II

3.　(a)　A three variable truth table has a high output for these input conditions: 000, 010, 100 and 110. What is the sum of products circuit? Simplify the sum of product equations.   5

　　(b)　Simplify the Boolean expression $\overline{X\overline{Y} + XYZ + X\left(Y + X\overline{Y}\right)}$ 4

　　(c)　Explain half adder with help of a circuit diagram.   5

4. (a) Draw the logic circuit for the Boolean expression:
$Y = \bar{A}\bar{B}CD + A\bar{B}\bar{C}D + AB\bar{C}\bar{D} + \bar{A}BC\bar{D}$. Draw the corresponding Karnaugh map. 2+1=3

(b) Prove that $A(\bar{A}+C)(\bar{A}B+C)(\bar{A}BC+C)=0$ 5

(c) Explain a 1:4 demultiplexer. 6

UNIT–III

5. (a) Draw logic circuit diagram of J-K flip-flop using NAND gate and explain it with necessary truth table and its timing diagram. 6

(b) Explain the operation of preset and clear condition. 5

(c) Differentiate between positive and negative edge triggering. 3

6. (a) Explain serial input parallel output shift register. 5

(b) Draw logic circuit diagram of D flip-flop and explain the truth table with timing diagram. 5

(c) An astable multivibrator circuit using 555 timer is shown in figure. Determine the time interval of charging (t_1), discharging (t_2), frequency and duty cycle of the output waveform. 4

UNIT–IV

7. (a) With the aid of a neat diagram, explain the operation of 3 bit asynchronous counter. 6

(b) Write a short note on random access memory (RAM). 4

(c) Discuss about cache memory with help of a block diagram. 4

8. (a) Explain a 4 bit decade counter. 6
   (b) Describe memory interfacing and its requirements for minimum mode memory interfacing. 4
   (c) Elaborate on the input/output devices of computer organisation. 4

UNIT–V

9. (a) With the help of a neat diagram, explain the architecture of 8085 microprocessor. List the features of 8085 microprocessor. 5+3=8
   (b) Discuss the description of timing and control unit in 8085 microprocessors. 6

10. (a) Explain different types of addressing modes in 8085, with example. 5
    (b) Draw the timing diagram of MVI A, data instruction and explain its operation. 4
    (c) Describe the function of special purpose registers in 8085 microprocessor. 5

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