

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2024
(Fifth Semester)
Branch – PHYSICS

PRINCIPLES OF DIGITAL ELECTRONICS

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 = 5)

- 1 Convert the hexadecimal number 1A3 to its decimal equivalent.
(i) 419 (ii) 421
(iii) 432 (iv) 499
- 2 Which of the following is a universal gate?
(i) AND gate (ii) OR gate
(iii) NAND gate (iv) NOR gate
- 3 Identify the primary function of a BCD Adder.
(i) Add two binary numbers (ii) Add two BCD numbers
(iii) Subtract binary numbers (iv) Convert binary numbers to decimal
- 4 What type of flip-flop is characterized by having a single data input and a clock input?
(i) SR Flip-Flop (ii) D Flip-Flop
(iii) JK Flip-Flop (iv) T Flip-Flop
- 5 What is the function of a 555 Timer in an astable mode?
(i) Generate a single pulse
(ii) Operate as a Schmitt Trigger
(iii) Generate a continuous square wave
(iv) Delay a pulse

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 3 = 15)

- 6 a) Explain how you would convert the binary number 1101 to its decimal equivalent.
OR
b) Describe the signed binary numbers with example.
- 7 a) Analyze the truth table of a NAND gate and describe its logic operation.
OR
b) Explain the procedure to simplify a Boolean expression using a Karnaugh map for a three-variable function.
- 8 a) Describe the functioning of Full Adder circuit and its application in binary addition.
OR
b) Draw a logic diagram of 1 to 4 line demultiplexer.

Cont...

- 9 a) Explain how a D flip-flop operates and its role in sequential circuits.
OR
b) Outline the steps to design a simple ring counter using flip-flops.
- 10 a) Describe the operation of a Binary Weighted Resistor D/A converter and its application.
OR
b) Sketch the internal structure of a 555 Timer and explain its use in an astable multivibrator mode.

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

- 11 a) Analyze the conversion process between various number systems (binary, octal, decimal, and hexadecimal). Provide an example of converting a number from each system to decimal and explain the steps involved.
OR
b) Discuss the process and steps involved in performing binary arithmetic operations: addition, subtraction, multiplication, and division.
- 12 a) How to prove the sum of products and product of sums are equivalent to one another in XOR function?
OR
b) Analyze the impact of De Morgan's Theorems on simplifying complex Boolean expressions. Provide examples to illustrate their use.
- 13 a) Describe the design and working principle of a 4-bit binary adder circuit. Include a discussion on its components and how it performs addition.
OR
b) Examine the process and application of converting binary numbers to Gray code and vice versa. Include examples for clarity.
- 14 a) Discuss the design and operation of synchronous counters and compare them with asynchronous counters. Highlight their advantages and disadvantages.
OR
b) Elucidate the concept and functionality of shift registers. Discuss their types (serial-in serial-out, parallel-in parallel-out) and their applications in data manipulation.
- 15 a) Discuss the principles and applications of Counter-type and Successive Approximation A/D converters. Compare their advantages and disadvantages.
OR
b) Design a astable multivibrator using 555 timer.

Z-Z-Z

END