22PHU518

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc- DEGREE EXAMINATION MAY 2025
(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 Which code is used to minimize the chance of errors during data transmission?
(i) ASCII (ii) Excess-3 Code
(iii) Gray Code (iv) 4221 Code

2 What is the Boolean expression for the output of an OR gate?
(i) A·B (ii) A+B
(iii) A-B (iv) A/B

3 Which combinational circuit converts binary numbers to Gray code?
(i) Decoder (ii) Encoder
(iii) Multiplexer (iv) Using EX-OR gates

4 Identify the counter which is designed to count events in synchronization with a clock signal.
(i) Asynchronous Counter (ii) Synchronous Counter
(iii) Ring Counter (iv) Shift Register

5 Where is a Dual Slope A/D Converter primarily used?
(i) High-speed applications (ii) Digital watches
(iii) Precision measurements (iv) Analog signal amplification

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a) Calculate the result of binary subtraction between 10110 and 01101 using 2's complement method.

OR

b) Outline the process for converting a hexadecimal number 2F into its binary form.

7 a) Compare the NAND and NOR gates in terms of their functionality as universal gates.

OR

b) Classify the given Boolean expressions into SOP (Sum of Products) or POS (Product of Sums): A+B·C and (A·B)+C

8 a) Solve a problem where you need to design a 4-bit binary adder circuit and explain its components.

OR

b) Explain the process of converting a binary number to Gray code using an EX-OR gate.

Cont...

9 a) Describe the working principle of a synchronous counter and how it differs from an asynchronous counter.

OR

b) Analyze the function of a shift register in data storage and its applications.

10 a) Explain how a counter-type A/D converter functions and where it is typically used.

OR

b) Summarize the main differences between the Dual Slope and Successive Approximation A/D converters.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a) Differentiate between BCD (Binary-Coded Decimal) and Gray code. Discuss their applications and how they affect digital systems.

OR

b) Elucidate the concept of 1's and 2's complements in binary arithmetic. Discuss their significance and applications in digital circuits.

12 a) Outline the procedure for simplifying a Boolean expression using Karnaugh Maps (K-map) for a four-variable function. Provide an example.

OR

b) Examine the use of Karnaugh Maps (K-maps) in minimizing Boolean functions for a three-variable system. Illustrate with a practical example.

13 a) Discuss the role of a BCD adder in digital systems and its functionality in handling decimal digits. Illustrate with an example of adding two BCD numbers.

OR

b) Outline the implementation and benefits of using multiplexers and demultiplexers in digital circuits. Provide examples.

14 a) Analyze the functionality and timing diagrams of SR, D, and JK flip-flops. Discuss their applications in digital sequential circuits.

OR

b) Trace the operation of a ring counter and a Johnson counter, highlighting their differences and uses in digital systems.

15 a) Elucidate the working principles of a Binary Weighted Resistor D/A Converter and a R-2R Ladder D/A Converter. Discuss their advantages and limitations.

OR

b) Describe the internal structure and operation of a 555 Timer. Explain its use in both astable and monostable modes with examples.

Z-Z-Z END