

M.Sc.(Phy.) Semester - 3 (CBCS) Examination**OCT/NOV-2024****Analog and Digital Systems (Elective (New))****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que-1 Answer the following: Any SEVEN out of TEN objectives type short questions. (14)

- (1) Compare transistor amplifier and operational amplifier in brief.
- (2) Draw and label the schematic symbol for operational amplifier.
- (3) Define: RF and AF filters
- (4) Define Subtracters.
- (5) List the applications of op-amp.
- (6) Draw the circuit of 4-bit shift right register using D-flip flops.
- (7) Draw the logic circuit of the following Boolean expression : $F = A' \cdot B' + A \cdot B$
- (8) What is Flip-Flop? give the names of different types of flip-flops.
- (9) What do you mean by feedback ? What are the different types of feedback ?
- (10) Convert decimal number 8421 in BCD code

Que-2 Answer the following: Any two out of three questions. (14)

- (1) Define any seven electrical parameters of an operational amplifier.
- (2) Draw block diagram of multistage op-amp and discuss the functioning of each block.
- (3) Define and interpret the op-amp parameters: CMRR, slew rate, SVRR, and Input offset voltage.

Que-3 Answer the following.

- (A) Draw and discuss frequency response curves of various types of active filters. (07)
- (B) Discuss in detail: BCD to Excess-3 code converter. (07)

OR

Que-3 Answer the following.

- (A) Design binary full adder circuit having three inputs: X_n , Y_n , and previous carry C_{n-1} and two outputs S_n and C_n . Derive canonical Boolean expressions for outputs S_n and C_n and implement the circuit by using logic gates. (07)
- (B) Design 4-bit magnitude comparator circuit which compares two binary numbers $A = A_0 A_1 A_2 A_3$ and $B = B_0 B_1 B_2 B_3$ and produces three outputs $A = B$, $A > B$ and $A < B$. Sketch the circuit neatly. (07)

Que-4 Answer the following: Any TWO out of THREE questions. (14)

- (1) Explain in detail: 4-bit synchronous counter and its operation with the appropriate circuit.
- (2) Write a note on the presettable counter.
- (3) Write a brief note on the ring counter and its applications.

Que-5 Write a short note on any TWO out of FOUR. (14)

- (1) Op-amp as a zero-crossing detector
- (2) Op-amp inverting amplifier as summing, scaling and averaging amplifier
- (3) Tracking analog to digital converter.
- (4) Successive approximation converter.
