

M.Sc.(Phy.) Semester - 3 (CBCS) Examination
Nov/Dec-2023 (NEW COURSE)
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. List the ideal operational amplifier characteristics.
 2. Draw and label schematic symbol for operational amplifier.
 3. Define: Filter. What are different types of filter?
 4. In which way operational amplifier is superior to transistor amplifier?
 5. List the applications of op-amp.
 6. Which one is the fastest and expensive ADC?
 7. Write Boolean expression for 2- variable equivalence function.
 8. Draw the circuit of 4-bit shift left register.
 9. What will be the output binary number of a MOD-32 ripple counter which is initially in its reset condition, after 1000 clock pulses applied?
 10. What are BCD codes? Convert 1234 in BCD code.
- Que.2 Answer the following: Any two out of three questions. (14)
1. Discuss designing steps of the differential amplifier from two emitter biased circuits.
 2. Draw and discuss block diagram of a typical op-amp.
 3. Define the interpret the following op-amp parameters: CMRR, Slew rate, SVRR, Input offset voltage.
- Que.3 Answer the following.
- (A) Draw and discuss frequency response curves of various types of active filters. (07)
- (B) Discuss steps of designing of low pass filter. Design a low pass filter at a cut-off frequency of 1 kHz with a pass band gain of 2. (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 prove that:
- $$S_n = X_n \oplus Y_n \oplus C_{n-1}$$
- Implement the circuit by using logic gates.
- (B) Write Boolean expression for complement of Exclusive – OR gate. What is this function? Design 4-bit magnitude comparator circuit which compares two 4-bit numbers. Sketch the circuit neatly. (07)
- Que.4 Answer the following: Any TWO out of THREE questions. (14)
1. Draw the circuit of synchronous MOD-8 counter and explain its operation with counting sequence and timing diagram.
 2. Write a note on presettable counter.
 3. What are the applications of shift-registers? Write brief note on Ring counters.
- 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. BCD to Excess-3 code converter
 4. Tracking ADC
