

Answer All Questions. Be to the point. Draw neat diagrams.

- 1a Explain working of R-2R ladder 4 bit DAC with help of neat diagram. Draw equivalent circuit and calculate analog output corresponding to 1000. Take analog output to be 15 for 1111. Make any required assumption justifying the assumption. (5)
- 1b Draw the staircase waveform of an DAC with digital number on x axis for staircase shaped analog waveform putting analog voltage on y axis, for a 3 bit digital number. Take value of analog output to be 7 V for 111. Explain gain and quantization error in DAC using above waveform. Make any required assumption justifying the assumption. (5)
- 2a Explain need of "sample and hold" in ADC. With help of sinusoidal analog input signal, explain the output waveform of "sample hold circuit" drawing the waveform for two consecutive samples, showing, periods of "start of conversion" "end of conversion" and in between output waveform. (5)
- 2b Write a short note explaining working of any ONE of Dual Slope OR Flash ADC with neat diagram (5)
- 3a Explain with neat diagram and derivation working of a probe for coaxial cable that can measure reflected component of V_r of voltage wave. Make suitable assumptions if needed. (5)
- 3b Define S_{21} and derive its value in terms of output terminal voltage V_2 and input generator voltage E , making suitable assumptions. (5)
- 4a For a voltage source V_s having source resistance R_s feeding a resistor R_L via a long wire A, is facing electrical interference from a mains (220 V 50Hz) wire M. Draw equivalent circuit of noise coupled from mains wire to R_L . Explain with help of another equivalent circuit how use of coaxial cable connecting V_s , R_s to R_L can reduce this noise. Assume suitable capacitances for explaining the equivalent circuits in each case and make any other assumptions giving due justifications. (5)
- 4b Explain how a time varying current in a wire can induce noise in a nearby circuit. Spell the laws involved in this noise coupling and draw the equivalent circuit of magnetic noise induction. Explain how a braided wire can reduce noise emission as well induction. (5)
- 5a Taking example of small signal amplifier, and a power amplifier both connected to a single battery, explain what is conductive interference. Explain how both circuits may be connected to the battery to induce "least noise" in the small signal amplifier. Make needed assumptions in forming equivalent circuits for conductive noise, justifying them. (5)
- 5b Compare and contrast, opto-coupling and transformer-coupling of circuits to reduce ground loop noise (5)
- 6 For an amplifier fed by voltage source V_s with source impedance R_s , (a) explain how shielding it can prevent injection of electrical noise in the amplifier from a nearby mains wire. (b) Draw the correct method of connecting circuit LO, Ground, and Shield. (c) Also give wrong method of these connections. Explain both cases showing flow of noise inducing currents. (d) Explain necessity of connecting shield to LO. (d) Why should shield be grounded. (e) If current is also flowing in mains wire, will there be noise injection for case (b), justify your answer. (10)