

# Adichunchanagiri University

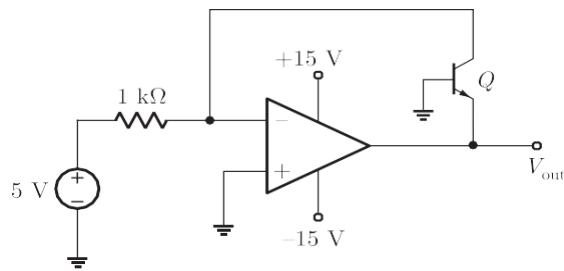
Ph.D Entrance Examination – Jan 2019

**Subject: Electronics and Communication Engineering**

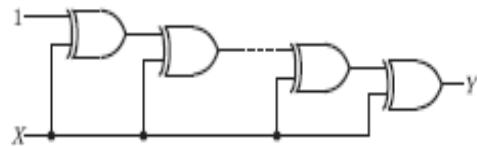
## Model Question Paper

**Answer any 20 questions out of 30 questions. Each question carries 1 Mark**

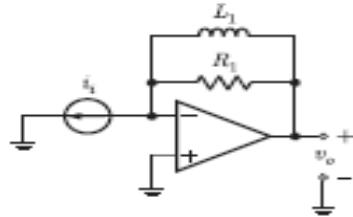
1. In the circuit shown below what is the output voltage ( $V_{out}$ ) if a silicon transistor and an ideal op-amp are used?



2. What is the most commonly used amplifier in Sample and Hold circuits.
3. Why four diode bridge rectifier is claimed in full wave rectification.
4. A bandlimited signal is sampled at the Nyquist rate. Then how the signal can be recovered by passing the samples?
5. How much number of comparators are required in a 3-bit comparators type ADC?
6. If the input to the digital circuit as shown in the figure consisting of a cascade of 20 XOR - gates is  $X$ , then what is the output  $Y$  ?

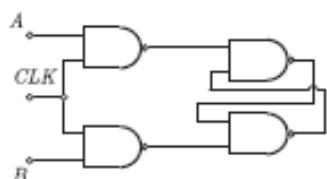


7. The circuit below implements a filter between the input current  $i_i$  and the output voltage  $v_o$ . Assume that the op-amp is ideal. What type of filter was implemented?

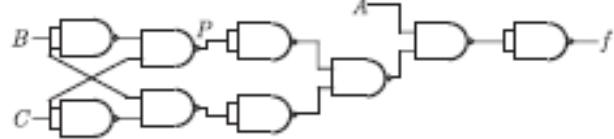


8. Define Hilbert transfer function.
9. An analog signal is band-limited to 4 kHz, sampled at the Nyquist rate and the samples are quantized into 4 levels. The quantized levels are assumed to be independent and equally probable. If we transmit two quantized samples per second, what is the information rate.
10. Suppose that the modulating signal is  $m(t)=2\cos(2\pi f_m t)$  and the carrier signal is  $x_c(t) = A_c \cos(2\pi f_c t)$ . write the conventional AM signal without over-modulation
11. Which analog modulation scheme requires the minimum transmitted power and minimum channel bandwidth.
12. The open loop function of a unity-gain feedback control system is given by  $G(s) = \frac{K}{(s+1)(s+2)}$ . What is the gain margin of the system in dB.

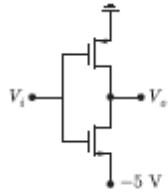
13. Write the race around for the given circuit.



14. What are the minimum numbers of NOT gates and 2 - input OR gates required to design the logic of the driver for this 7 - Segment display.
15. The point P in the following figure is stuck at 1 what is the output f.



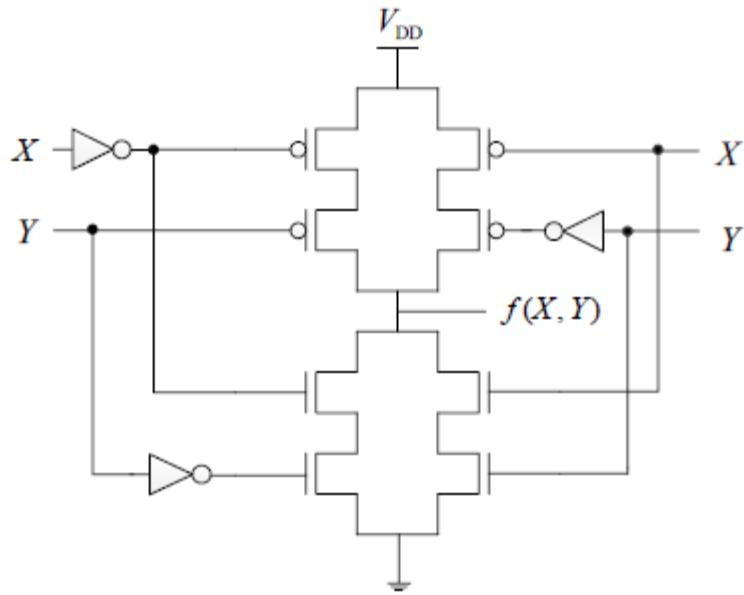
16. Why Commercially available ECL gears are two ground lines and one negative supply?
17. The threshold voltage for each transistor in the figure is 2 V. For this circuit to work as an inverter,  $V_i$  must take the values



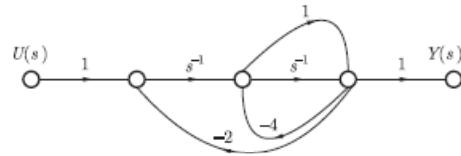
18. Why schottky clamping is resorted in TTI gates.
19. A Transmission line has a characteristic impedance of  $50 \Omega$  and a resistance of  $0.1 \Omega/m$ . If the line is distortion less, what is the attenuation constant (in  $N_p/m$ )?
20. Define Half Power Beam Width.
21. In a microwave test bench, why is the microwave signal amplitude modulated at 1KHz.
22. In a MOSFET operating in the saturation region. Then, what is the effect cause in chaneel length modulation.
23. Why thin gate oxide will preferably grow in CMOS process?
24. What is the bandgap of silicon at room temperature.
25. A network has 7 nodes and 5 independent loops. How many number of branches are there in the network.
26. What are periodic signals?
27. What is the period of the signal  $x(t) = 8 \sin\left(0.8\pi t + \frac{\pi}{4}\right)$ ?
28. Explain how binary number can give a signal or convert into a digital signal.
29. What are the two types of procedural blocks in Verilog?
30. Why transducer used in measurement system?

**Answer any 10 questions out of 15 questions. Each question carries 2 Marks**

31. What is the logic function  $f(X, Y)$  realized by the given circuit.



32. The signal flow graph for a system is given below. Write the transfer function  $\frac{Y(s)}{U(s)}$  ?



33. The two numbers represented in signed 2's complement form are  $P = 11101101$  and  $Q = 11100110$ . If  $Q$  is subtracted from  $P$ , what is the value obtained in signed 2's complement?

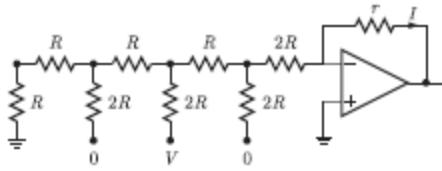
34. The state equation and the output equation of a control system are given below:

$$\dot{\mathbf{x}} = \begin{bmatrix} -4 & -1.5 \\ 4 & 0 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 2 \\ 0 \end{bmatrix} u,$$

$$\mathbf{y} = \begin{bmatrix} 1.5 & 0.625 \end{bmatrix} \mathbf{x}.$$

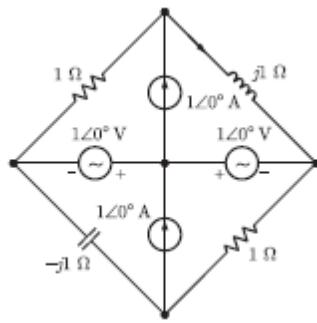
What is the transfer function representation of the system?

35. What is the current  $I$  through resistance  $r$  in the circuit shown in the figure is



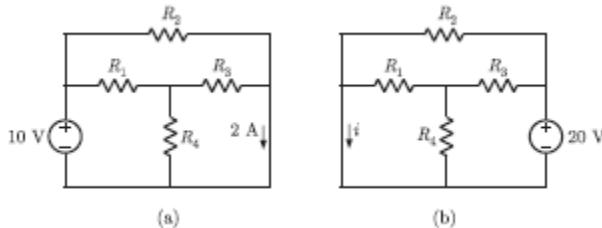
36. The drain of an n-channel MOSFET is shorted to the gate so that  $VGS = VDS$ . The threshold voltage ( $VT$ ) of the MOSFET is 1 V. If the drain current ( $ID$ ) is 1 mA for  $VGS = 2$  V, then for  $VGS = 3$  V, Derive  $ID$ ?

37. In the circuit shown below, What is the current through the inductor?

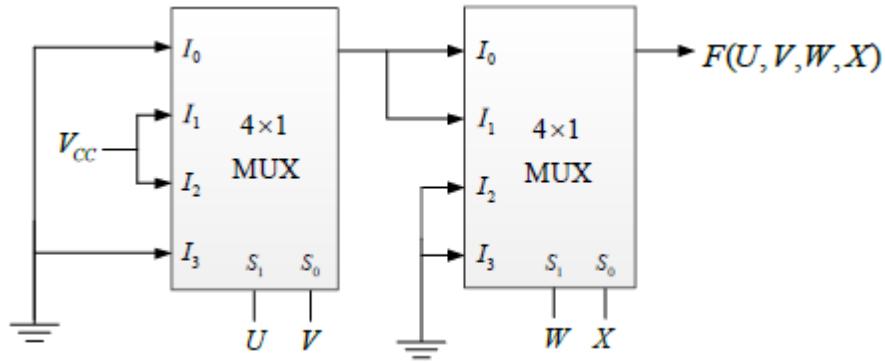


38. In a series  $RLC$  circuit,  $R = 2 \text{ k } \Omega$ ,  $L = 1 \text{ H}$ , and  $C = \frac{1}{400} \mu\text{F}$ . What is the resonant Frequency?

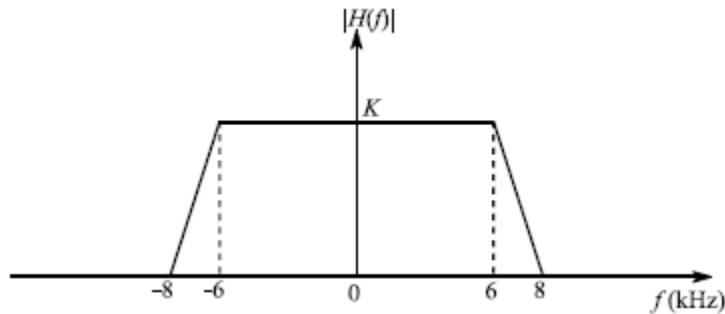
39. Use the data of the figure (a). Define current  $i$  in the circuit of the figure (b)



40. A four-variable Boolean function is realized using  $4 \times 1$  multiplexers as shown in the figure. Find the minimized expression for  $F(U,V,W,X)$ .

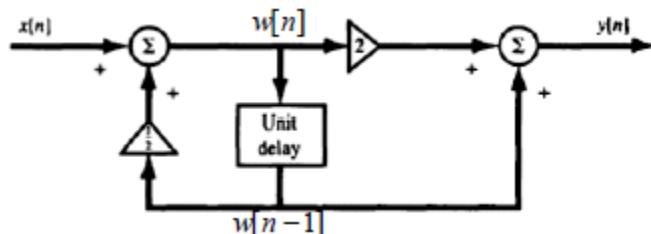


41. A band limited low-pass signal ( $t$ ) of bandwidth 5 kHz is sampled at a sampling rate  $f_s$ . The signal ( $t$ ) is reconstructed using the reconstruction filter  $H(f)$  whose magnitude response is shown below:

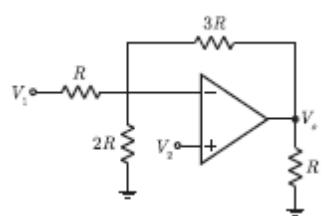


What is the minimum sampling rate  $f_s$  (in KHz) for perfect reconstruction of  $x(t)$ ?

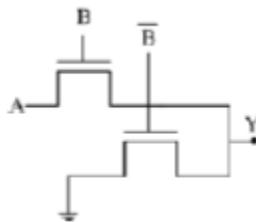
42. Write the input-output equation for the system.



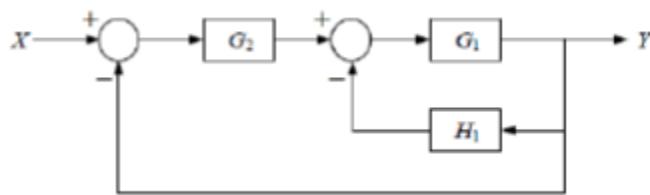
43. Assuming that the Op-amp in the circuit shown is ideal, What is the value of  $V_0$ ?



44. Write the logic functionality realized by the circuit shown below is



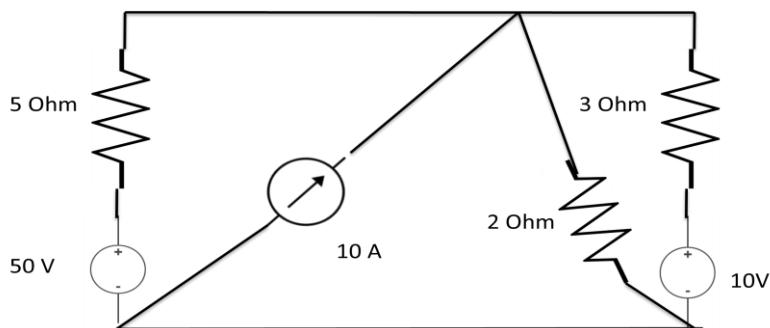
45. The block diagram of a feedback control system is shown in the figure. What is the overall closed-loop gain G of the system?



**Answer any 5 questions out of 10 questions. Each question carries 4 Marks**

46. Draw the graphical symbol and hybrid equivalent model for CE and CB Configuration.

47. Using source transformation, find power delivered by 50V source, as shown in below figure.



48. State the properties of Discrete Time Fourier series.

49. Explain the working of a true RMS voltmeter with the help of a suitable block diagram.

50. Simplify the function using K-map

$Y = f(a, b, c, d) = \sum_m(0, 1, 2, 3, 5, 6, 8, 10, 15)$  and write the simplified SOP expression.

51. State and explain Routh-Hurwitz criterion.

52. An amplifier with 10dB noise figure and 4dB power gain is cascaded with a second amplifier has a 10dB power gain and 10 dB noise figure. What is the overall noise figure and power gain?
53. Explain how anti-saturation base drive control improves the switching performance of BJT?
54. Draw the circuit and stick diagram for one-bit CMOS shift register.
55. Briefly explain the operations of the string instructions of 8086, indicating the initializations required to use them.