M.Sc-1[Physics]
ELECTRONICS [PHY4104]

Question Bank

Short Answer Questions.

1.Define:

i. CMRR
ii. Slew rate

2.What are the active and passive filters?

3.What do you mean by Cut-off frequency and Notch frequency?

4.Draw the output waveform of Integrator and differentiator for the square wave input signal?

5.What are the applications of OP-AMP?

6.Write the closed loop voltage gain equation for Inverting and Non-inverting configuration of OP-AMP?

7.What is the trigger pulse?

8.Distinguish between combinational and sequential logic.

9.Write applications of flip-flops.

10.Explain Master-Slave JK flip-flop.

11.Explain SOP and POS expressions with suitable example.

12.Define Shift-Registers. State its types.

13. Define modulation. State itstypes.
14.Define amplitude modulation.

15. Define frequency modulation.

16.Define phase modulation.
17.What do you mean by carrier wave? Give its importance in modulation process.
18.Define noise in modern communicationsystems.
19.The absolute gain of an amplifier is 30; find its decibel gain.
20.CMRR for the differential amplifier should be high. Comment.
21.What is the voltage follower?
22.What do you mean by stop band?
23. What do you mean by pass band?
24.What do you mean by filters?
25.Define minterm.
26. Define maxterm.
27.Draw a pair, a quad, and an octet on K-map.

28. Define Synchronous counter.
29. Define Asynchronous counter.
30. “Asynchronous counter is faster in operation than a synchronous counter”

comment.
31. Define modulus of counter.
32. Define up-down counter.
33.Determine the number of flip-flops that would be required to build the following counters:
a) Mod -12 b) Mod-31
33. What is the fastest method of A/D conversion?
34. What is the advantage of R/2R ladder DACs over those that use binary- weighted register?
35. What is the percent resolution of a 4 – bit DAC?
36. What is the percent resolution of a 3-bit DAC?
37.Map the following expression on a K-map.

$$\overline{A}.\overline{B}.C + A.B.C + \overline{A}.B.C + A.\overline{B}.\overline{C}$$

38.Map the following expression on a K-map.

$$A.B + \overline{A}.\overline{B} + A.\overline{B}$$

39.Map the following expression on a K-map.

$$(\overline{A}+\overline{B}+\overline{C})\,(A+\overline{B}+C)\,(A+\overline{B}+\overline{C})\,(A+B+C)$$

40.Map the following expression on a K-map.

$$(A+\overline{B}+C)\,(\overline{A}+B+\overline{C})\,(A+B+\overline{C})\,(\overline{A}+B+C)$$

Short Notes.

1.Sample and hold circuit.

2.Virtual ground and virtual short.

3.Op-amp as a Adder.

4.Op-amp as a integrator.

5.Op-amp as a differentiator.

6.Narrow Band Pass Filter.

7.Microwave oscillators.

8.Digital Modulation.

9.Counter Type ADC.

10.Binary weighted type DAC

11.SR Flip Flop.

12.T-Toggle and D-Data Flip Flop.

13.Ideal Parameters of Op-Amp.

14.SISO Shift Registers.

15.Karnaugh map.

16.Half Wave precision rectifiers.

17.Full wave precision rectifiers.

18. SIPO Shift Registers.

19. Active Low Pass Filter.

20. Active High Pass Filter.

Long Answer Questions.

1. Explain with a neat diagram the working of a 3 - bit up - down counter. Also give its output waveforms.
2. Give the circuit diagram of square wave generator using an op-amp and Explain its working.
3. Give the circuit diagram of R-2R Ladder type converter. Discuss the working of it.
4. Derive an expression for gain of non-inverting amplifier using OPAMP. state its advantages over inverting amplifier.
5. Give the circuit diagram of shift register using IC 7495, to explain SIPO and PIPO operation.
6. State necessary requirements of an instrumentation amplifier.
7. Draw a block diagram of counter type ADC. Explain its operation.
8. Give internal circuit diagram for decade counter using IC7490 and explain its working and also give its applications.
9. How to convert square wave input into triangular output and vice versa? Also for sinewave to triangular and vice versa.
10. Explain the conversion time for the following ADCs.

    1. Dual slope
    2. Simultaneous type
    3. Counter type and
    4. Successive Approximation type.

11. Explain the advantages of Instrumentation Amplifier over op-amplifier.
12. Explain first order high pass filter using op-amp and obtain its transfer function.
13. Explain 2-bit simultaneous A/D converter with Logic diagram .
14. Draw a block diagram of 4.bit parallel binary UP/DOWN Counter. Explain its operation with reference to timing diagrams.
15. Explain with a neat diagram the working of a 4-bit up-down counter.
16. Explain with a neat diagram the working of a 4-bit decade counter.
17. Discuss the working of a successive approximation type ADC.
18. What is k - map? Write a truth table for four input variables has a high output for an input of 0000, low output for 000l to l00l and don't cares for 1010 to llll. What is the simplest logic circuit with this truth table?
19. Draw circuit diagram of half-wave precision rectifier. Explain its operation.

20. Draw a circuit diagram of 2-bit flash ADC. Explain its operation. State its merits and demerits.
21. Draw the circuit diagram of 3- bit simultaneous type ADC. Explain its working in detail. Write a logic table, logic equations for V_{input}. Explain also conversion time for same.
22. Derive an output relation for 4-bit Binary Weighted Resistor DAC with the necessary circuit diagram. Explain its working. What are drawback for higher bit of DAC?
23. Derive an expression for Instrumentation Amplier output using op-Amps.
24. Draw the circuit diagram of a full-wave precision rectifier using op-Amp. Draw input and output waveforms. Explain its working.
25. Explain the operation of counter type ADC. Discuss it merits and demerits.
26. Explain the operation of Simultaneous ADC. Discuss its merits and demerits.
27. Explain the operation of successive approximation ADC. Discuss it merits and demerits.
28. Draw the diagram of JK flip flop based on Master Save FF .Explain working principle of JK FF for different input of J and K.
29. Draw the logic diagram;construct the excitation table and write the characteristics equaitions for the following Flip-Flop.
    i) R-S Latch
    ii) Gated R-S Latch
    iii) JK
    iv) T-Toggle
    v) D-Data

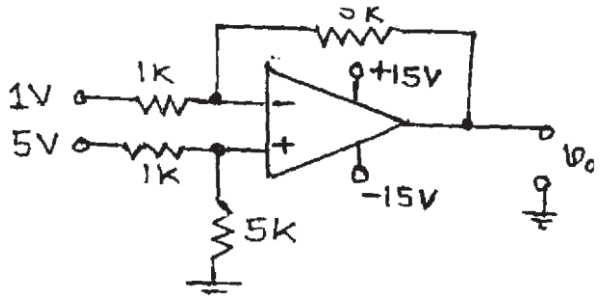
Problem Solving.

1) For 8-bit ADC with V_{ref} = l.024V, clock frequency = 500 kHz and Vinput = 0.37V.
   Find i) the digital output for counter type ADC and find analog output using counter type ADC. and
   ii) conversion time for counter type and successive Approximation type.

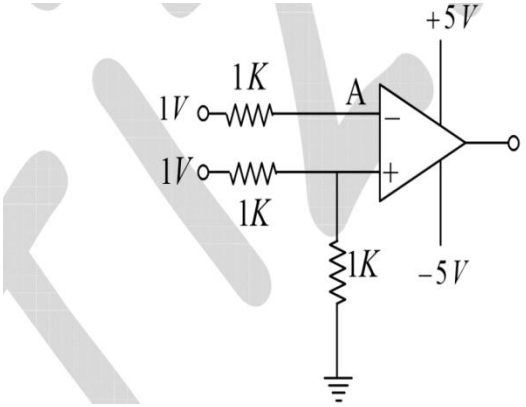
2) A differential amplifier has a differential gain A_d of 100. The input voltages applied are v_1=1mV and v_2=0.9mV. Calculate the output voltage for a) CMRR=100 b) CMRR=1000 and c) CMRR=10,000.

3) For the inverting amplifier given that R_{in}=500Ω and R_f=20KΩ. Assuming an ideal amplifier, calculate the output voltage for the input of 100 MV.
4) For the non-inverting amplifier given that input voltage is 6V and R_1=2kΩ and R_f=10kΩ. Calculate the output voltage.
5) Find Cut-Off frequency of the given active low pass filterwith R=10 kΩ,C=0.1μF.
6) For Band Pass Filter ,Lower cut-off Frequency is 300 Hz and Upper cut-off Frequency 3.3 kHz. Find center frequency and quality factor.
7) Minimize the following Boolean expression using k-map and realize it using the logic gate.

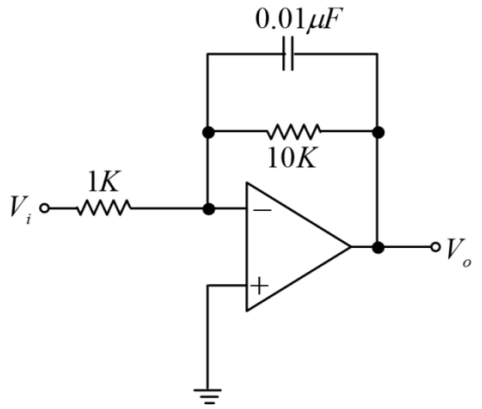
   Y=□m□1,3,5,9,11,13□.
8) Find Binary equivalent weight of each 4-bit system and 3-bit system.
9) For a 5-bit resistive divider,Determine the following.
   1. Weight assigned to the LSB
   2. The output voltage for a digital input 10101.Assume 0=0V and 1=1V
10) What are the output voltages by each levels in 5-bit ladder ,if the input levels are 0=0V and 1=10V?
11) Find the output voltage for 5-bit ladder that has a digital input of 11010.Assume 0=0V and 1=10V.
12) What is the resolution of 9-bit D to A Converter which uses a ladder network?What is the resolution expressed in a percent?If the full scale output voltage of this converter is +5 V,what is the resolution in Volts.
13) Find the output voltage of a 6-bit binary ladder with the following inputs.
    a) 101001
    b) 111011
    c) 110001
14) For the inverting amplifier given that R_{in}=kΩ and R_f=10kΩ. Assuming an ideal amplifier, calculate the output voltage for the input of 1V.
15) For the non-inverting amplifier given that input voltage is 4V and R_1=1kΩ and R_f=5kΩ. Calculate the output voltage.
16) Calculate the conversion time for a 4V input Successive approximation ADC,given if F_{clock}=1 MHz,V_{ref}=10 V and resolution=16 bits.
17) An op-amp is used in following modes with R_s = 1 kΩ and R_f= l00 k Ω, V_i = 120 MV and V_{cc} = 12V. Find output V_{out} in inverting and Non-inverting modes.
18) Find the output of op-amp of the following circuit.



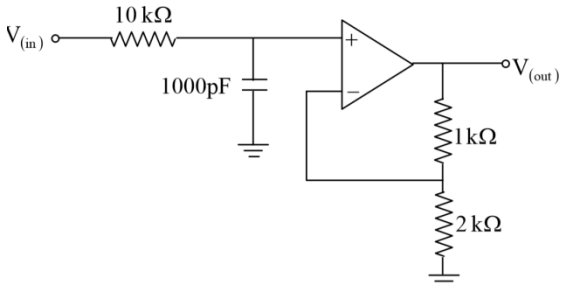
19) In the operational amplifier circuit below,what is the voltage at point A ?



20) In the op-amp circuit shown in the figure, Vi is a sinusoidal input signal of frequency 10 Hz and V0 is the output signal. The magnitude of the gain and the phase shift, respectively, close to the values



21) For this circuit the what is the frequency above which the gain will decrease by 20 dB per decade and At 2. 1kHz the value closed loop gain .



22) Consider an ideal operational amplifier as shown in the figure below with R_1 =5 kΩ,R_2 =1 kΩ,R_L =100kΩ.The current passing through resistor R_2 when applied input voltage V=10 Mv is?