# Question Bank for Mid Sem Exam-1, April 2017

## First year-Sem.II (EC,IC,EE.CE.IT)

## Subject: Basic Electronics Subject Code : ( 2110016)

**Objective Questions (MCQ)**

**1** Which component has a positive and a negative side?
(a) A potentiometer (b) A fuse (c) A resistor (d) A battery

**2** To increase the current capacity of a cell, several cells should be connected in:
(a) parallel (b) series (c) parallel resonant (d) series resonant

**3** Which tolerance rating would a high-quality resistor have?
(a) 5% (b) 10% (c) 20% (d) 0.1%

**4** What does a common multimeter measure?
(a) Resistance, capacitance and inductance (b) Voltage, current and resistance
(c) Resistance and reactance (d) SWR and power

**5** Potential difference is measured by means of:
(a) a wattmeter (b) an ohmmeter (c) a voltmeter (d) an ammeter

**6** A resistor in a circuit becomes very hot and starts to burn. This is because the resistor is dissipating too much:
(a) voltage (b) resistance (c) current (d) power

**7** In most of modern IC op-amps, the 741 requires _____ power supplies
(a) 1 (b) 2 (c) 3 (d) 4

**8** A circuit designed to increase the level of its input signal is called:
(a) an amplifier (b) a modulator (c) an oscillator (d) a receiver

**9** All arithmetic operation take place in the _____ of a computer
(a) CPU (b) ALU (c) ROM (d)Microprocessor

**10** The logic gate which detects equality of two bits is
(a) EX-OR (b) EX-NOR (c) NOR (d) NAND

**11** The basic building block for a logical circuit is _____
(a) A flip flop (b) A logical gate (c) Multiplexer (d) Decoder

**12** The frequency that has the longest period is
(a) 10 KHz (b) 1 KHz (c) 10 Hz (d) 1 Hz

**13** Ohm's law (V = IR)
(a) Can be applied to A.C. similar to that of D.C..
(b) Can be applied to A.C. but after replacing R by Z (impedance)
(c) Can never be applied to A.C.
(d) None of the above

**14** The difference in period of two frequencies of 1MHz and 2 MHz is
(a) 0.5 milli-seconds (b) 0.5 micro-seconds (c) 1 milli-seconds (d) 1 micro-seconds

**15** Conductance is expressed in terms of
(a) ohm / m (b) m / ohm (c) mho / m (d) mho.

**16** Which resistor will be physically larger in size ?
(a)10 ohm, 50 W (b) 100 ohm, 10 W (c) 1 kohm, 1 W (d) 10 Mohm, 1/ 2 W.

**17** The output of a logic gate is '1' when all its input are at logic 0.The gate is either
(a) NAND or an EX OR gate (b) NOR or an EX-NOR gate
(c) an OR or an EX NOR gate (d) an AND or an EX-OR gate

**18** IC741 use a _____ polarity supply.
(a) Dual (b) Single (c) Negative (d) None of Above

**19** CPU communicates with the outside world through the _____.
(a) Memory (b) I/O devices (c) ALU (d) None of Above

**20** In hydraulic system, Quantity named Flow is described as a Output flow rate Fo , and in electrical quantity it is described as a_____.
(a) Voltage , (b) Current, (c) Capacitance, (d) Inductance

**21** To find the linearity of the circuit network which theorem is used?
(a) KCL, (b) KVL, (c) Superposition, (d) Maximum Power Transfer

**22** For the operational amplifier with inverting configuration the change in the phase of the output voltage is _____.
(a) $180^{O}$, (b) $90^{O}$, (c) $270^{0}$, (d) $45^{O}$

**23** Which one is the Linear application design by Op-amp ?
(a) Integrator, (b) Voltage Regulator, (c) Multiplier, (d) Comparator

**24** The equivalent Decimal of the BCD $(001110001001)_{BCD}$ is_____.
(a) $(388)_{10}$, (b) $(386)_{10}$, (c) $(380)_{10}$, (d) $(389)_{10}$

**25** Which are the logic gates kwon as a Universal Gates?
(a) XOR, AND, (b) AND, OR, (c) NAND, NOR, (d) XNOR,OR

**26** By using which theorem we can replace the whole circuit network in single voltage and resistor network?
(a) Superposition, (b) Maximum power Transfer,
(c) Norton's Theorem, (d) Thevenin'sTheroem

**27** From the given statements identify which one is wrong for ideal – op amp
(a) Input Resistance is infinite
(b) Output Resistance is infinite
(c) Slew rate is infinite
(d) Common Mode Rejection Ration is infinite

**28** According to coloumb's Law electric force is inversely proportional to
(a) Distance. (b) Square of the distance.
(c) Multiplication of charge Q1 & Q2. (d) None of Above.

**29** $( 365.24)_8 = ( )_{10}$
a) 542.5213 b) 245.5213 c) 245.3125 d) 542.3125

**30** In design of ripple counter using J-K flip flop the inputs of all flip flop is
a) J=1, K=1 b) J=0, K=0 c) J=0, K=1 d) J=1, K=0

**31** Voltage follower configuration of OPAMP used for
a) Amplification b) Impedance matching c) Adder d) Substractor

**32** Typical value of CMRR and Slew rate for OP-AMP 741 are _____ and _____ respectively
a) 90 db, 0.5 V/μsec b) 90 db, 0.5 μV/sec
c) 9 db, 0.5 μV/sec d) 90 db, 0.5 V/sec

**33** For an ideal current source, the source resistance is _____
a) Zero b) Infinite c) Very small d) Nonzero

**34** While applying the super position theorem, the ____ is replaced by an open circuit.
a) Ideal Voltage Source b) Ideal Current Source
c) Capacitor d)Any Dependent Source

**35** A 12 V source has an internal resistance of 90? If a load resistance of 20? is connected to the voltage source, the load power, PL is
a) 2.38 mW b) 2.38 W c)238 mW d) 23.8 W

**36** Power is defined as the rate of transfer of _____with respect to time.
(a) Charge (b) Current (c) Energy (d) Voltage

**37** Mesh analysis is based on

(a) KVL (b) KCL (c) Both (d) Law of conversion of energy

**38** If the network elements such as resistances, capacitances, inductances are not physically separable, then it is known as
(a) Lumped Network (b) Distributed Network
(c) Unilateral Network (d) Bilateral Network

**39** Which of the following is not applicable to the nonlinear network?
(a) Thevenin (b) Norton (c) Superposition (d) KCL

**40** For Non inverting amplifier the phase shift between input and output is
(a) 270° (b) 45° (c) 180° (d) 0°

**41** Which one is Linear Application of Op-Amp?
(a) Comparator (b) Differentiator
(c) Schmitt trigger (d) Log Amplifier

**42** The decimal equivalent of Binary $(1111110)_2$ is
(a) 125 (b) 128 (c) 255 (d) 126

**43** The Digital Circuit which accepts many input and produces only one output is known as
(a) Encoder (d) Demultiplexer (c) Multiplexer (d) Decoder

**44** In an Electrical system, the flow of current follows:
(a) De Morgan's law (b) Boyle's law (c)Curie's law (d) Ohm's law

**45** The equivalent octal of the binary number (101010101011)2 is
(a) $(5352)_8$ (b) $(2523)_8$ (c) $(5253)_8$ (d) $(225253)_8$

**46** X(t)= - X(-t) is the property of
(a) Even signal (b) Odd signal (c)Periodic signal (d) Aperiodic signal

**47** If a 1 Hz square signal is given to a bulb, how long will it glow?
(a) 1second (b) 2 second (c) 0.5 second (d) 0 second

**48** The inductance offered by a inductor of 1 H to a DC signal is
(a) 0 (b) infinity (c) 1 (d) indeterminate

**49** Following gates are known as Universal Logic Gates
(a) AND, OR (b) NAND, NOR (c) AND, NOR (d) NAND,OR

**50** A circuit that converts AC signal to DC signal is known as a
(a) Rectifier circuit (b) Inverter circuit (c) RL circuit (d) RC circuit

**51** The IC 741 Operational Amplifier cannot:
(a) Add signals (b) Subtract signals (c) Transform signal (d) Differentiate signal

**52** A Flip Flop has got a memory of
(a) 1 bit (b) 2 bit (c) 4 bit (d) 8 bit

**53** An operational amplifier IC 741 has got
(a) 2 inputs, 1 outputs (b) 1 inputs, 2 outputs
(c) 1 input 1 output (d)2 inputs, 2 outputs

**54** A system is linear if _____ is true.
(a) KVL (b) KCL (c) Superposition theorem (d) Ohm's law

# Chapter 1. Circuit Concepts

1 Give the difference between conductor and insulator.

2. Explain the following terms:
   a. Electric Potential and Voltage
   b. Energy and Power
   c. Various type of sources
   d. Average value and RMS value of periodic waveform
   e. Active and Passive components.

3. Explain the following terms in brief:
   a. Resistor
   b. Inductor
   c. Capacitor

4. Derive the equation for energy stored in Capacitor and Inductor.

5 Explain in brief about Lumped circuit elements called resistor and capacitor.

6. Write a short note on Ammeter and Voltmeter.

7 State and prove Maximum power transfer theorem.

8. What is Ideal Transformer? Explain Elementary model of a two-winding core-type transformer (ideal transformer).

9. Explain Kirchhoff's voltage and current laws.

10. Explain voltmeter, Ammeter, Instrument transformers, Oscilloscope and Wheatstone bridge.

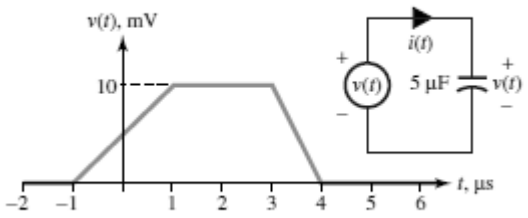
11 Compare analogy between Mechanical-Electrical systems, analogy between electrical and hydraulic systems and analogy between thermal and electrical systems.

12. Explain in brief about Dot Convention.

13. Classify the controlled source and draw schematics for each.

14. Write a short note on Cathode Ray Oscilloscope.

15. Consider a 5-$\mu$F capacitor to which a voltage $v(t)$ is applied, shown in Figure ,Sketch the capacitor current and stored energy as a function of time.




16. An electromechanical voltmeter with internal resistance of 1 k$\Omega$ and an electronic voltmeter with internal resistance of 10 M$\Omega$ are used separately to measure the potential difference between *A* and the ground of the circuit shown in Figure1.2. Calculate the voltages that will be indicated by each of the two instruments and the percentage error in each case.

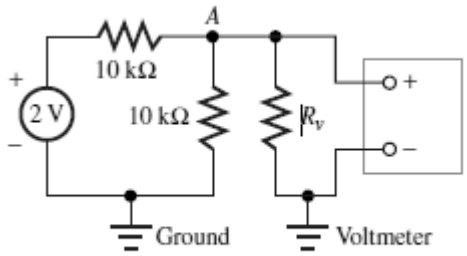



Figure 1.2

17. Given the network in Figure 1.3
    (a) Find the currents through resistors *R*1, *R*2, and *R*3.
    (b) Compute the voltage $V_1$
    (c) Show that the conservation of power is satisfied by the circuit.

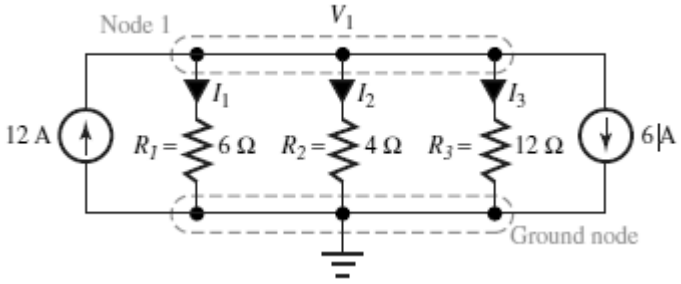



Figure 1.3

18. Consider a source of voltage $v(t) = 10\sqrt{2} \sin 2t$ V, with an internal resistance of 1800Ω. A transformer that can be considered ideal is used to couple a 50Ωresistive load to the source.
    (a) Determine the primary to secondary turns ratio of the transformer required to ensure maximum power transfer by matching the load and source resistances.
    (b) Find the average power delivered to the load.

19. Explain Coulomb's First and Second Law.

20. How does a Voltmeter differ from an Ammeter?

## Chapter 2. Circuit Analysis Techniques

1. Explain Thevenin's and Norton's theorem.
2. Explain Superposition Theorem.
3. Explain DELTA-WYE transformation in brief with necessary equations and circuit diagrams.
4. Discuss about Major features of a Spice-based circuit simulation program.
5. Draw Schematic diagram of MATLAB's main features.
6. Consider the circuit shown in Figure 2.1. Reduce the portion of the circuit to the left of Terminals *a–b* to (a) a Thevenin equivalent and (b) a Norton equivalent. Find the current through $R = 16\Omega$, and comment on whether resistance matching is accomplished for maximum power transfer.

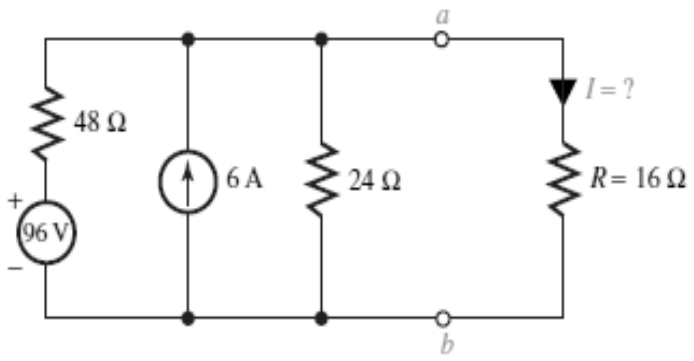



Figure 2.1

7. Consider the circuit of Figure 2.2, including a dependent source. Obtain the Thevenin equivalent at terminals *a–b*.

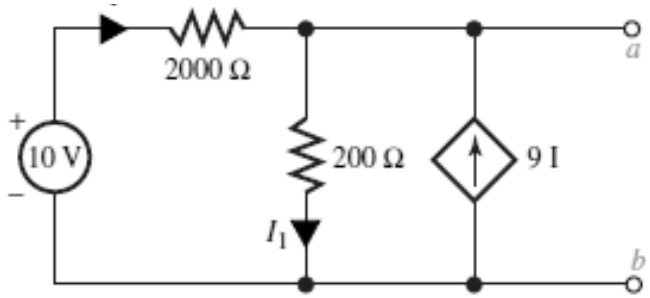



Figure 2.2

8. By means of nodal analysis, find the current delivered by the 10-V source and the voltage across the 10Ω resistance in the circuit shown in Figure 2.3.

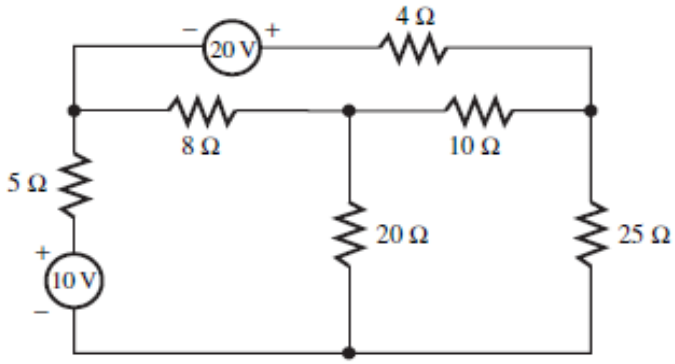



Figure 2.3

9. For the network shown in Figure 2.4, find the current in each resistor by means of nodal analysis.

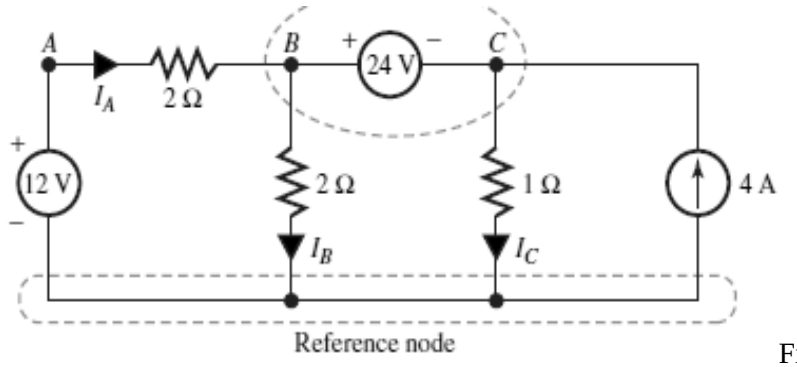



Figure 2.4

10. For the network shown in Figure 2.5, find the current delivered by the 10-V source and the voltage across the 3Ωresistor by means of mesh-current analysis.

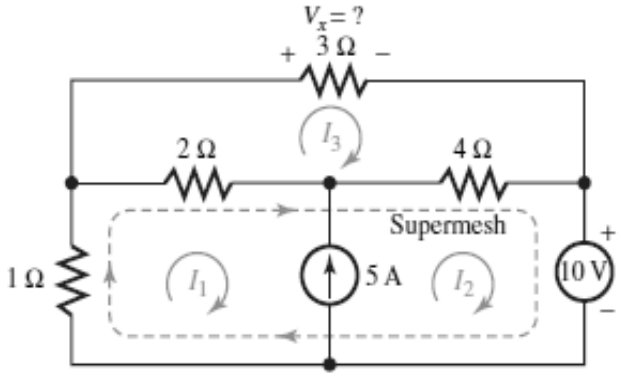



Figure 2.5

11. Consider the circuit in Figure 2.6, which include a controlled source, and find the current in the 5-V source and the voltage across the 5Ωresistor by using (a) the loop-current method and (b) the node-voltage method

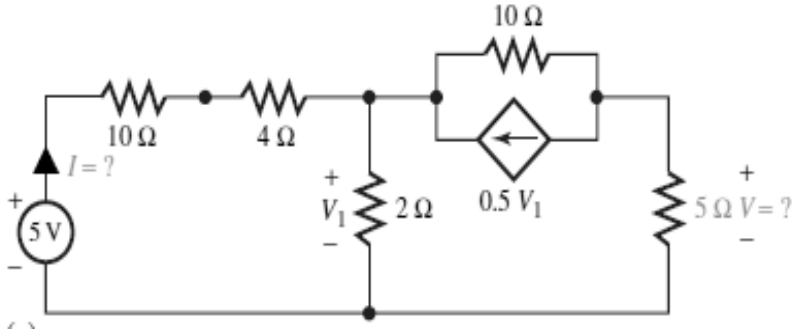



Figure 2.6

12. Determine the voltage across the 20Ωresistor in the following circuit of Figure 2.7 with the application of superposition.

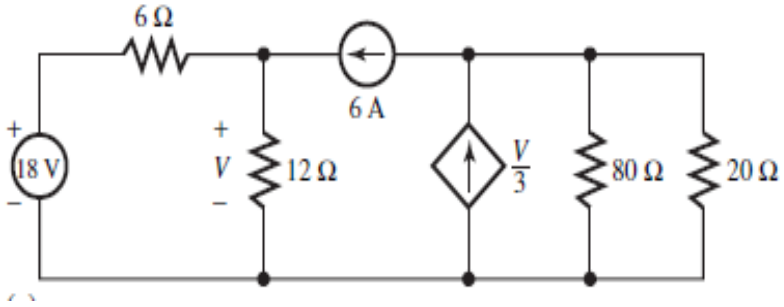
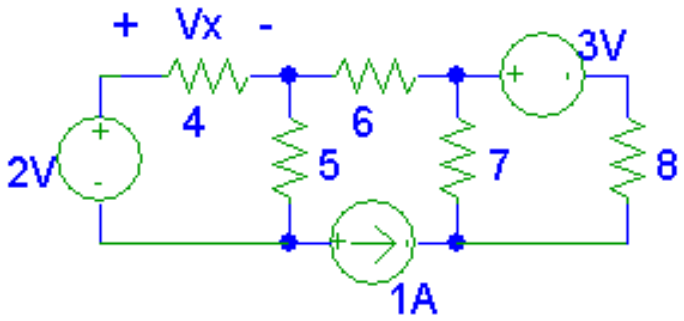



Figure 2.7

13. Find the voltage Vx using superposition theorem. All resistor values are in ohm.




14. Use delta–wye transformation for network reduction and determine the current through the 12Ω resistor in the circuit of Figure 2.8.

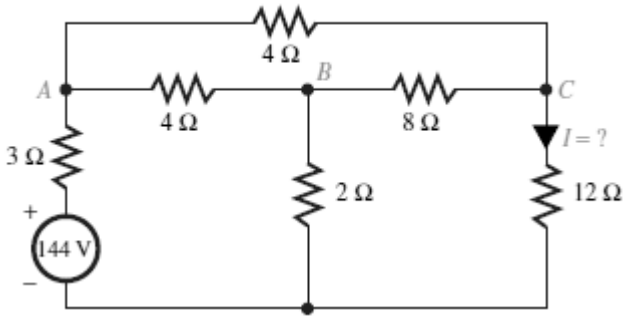



Figure 2.8

15. Find the current $I1$ through the 20Ω resistor of the circuit of Figure 2.9 by both mesh and nodal analyses.

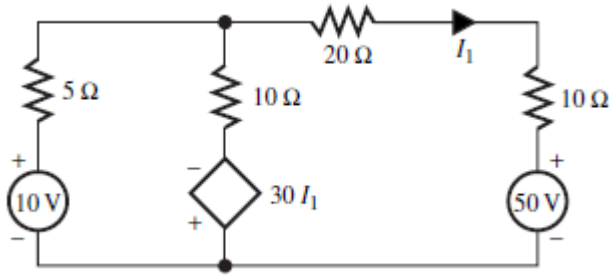



Figure 2.9

## Chapter 3. Analog Building Blocks and Operational Amplifiers

1. Draw and explain briefly the block diagram of typical Op-amp.

2. Explain Ideal characteristics of Op-Amp and Draw the equivalent circuit of Op-Amp.

3. Define briefly the following electrical parameters of Op-Amp.
    1. Input offset voltage ($V_{OS}$),
    2. Input offset Current( $I_{OS}$),
    3. Input bias current ($I_B$),
    4. CMRR,
    5. Slew Rate,
    6. Half power frequency(fh)
    7. Gain Bandwidth Product($f_{GB}$)
    8. Internal frequency compensation
    9. External frequency compensation
    10. Power – Supply Rejection Ratio (PSRR)
    11. Output Voltage Swing
    12. Virtual ground concept.

4. Draw the frequency response of open-loop and close-loop configuration of OP-Amp and define Gain Bandwidth Product

5. Derive the formula for voltage gain, $A_{VF}$ of
[1] Inverting amplifier [2] Non-inverting amplifier.

6. List out Linear and Nonlinear application of Op-Amp.

7. Draw the circuit diagram and derive the output equation for following amplifier:
    1. Inverting summing amplifier
    2. Non-inverting summing amplifier
    3. Current-to-current amplifier
    4. Current-to-voltage amplifier
    5. Charge-to-charge amplifier
    6. Negative Impedance converter
    7. Differential Amplifier
    8. Integrator
    9. Differentiator

8. Describe Low pass active filter using Operational amplifier with necessary diagram and equations.

9. Describe High pass active filter using Operational amplifier with necessary diagram and equations.

10. Describe Band pass active filter using Operational amplifier with necessary diagram and equations.

11. Consider the circuit of the *inverting amplifier* shown in Figure3.1, including an ideal op amp. Show that the voltage gain of the overall circuit *vo*/*vi* is independent of the op-amp parameters.

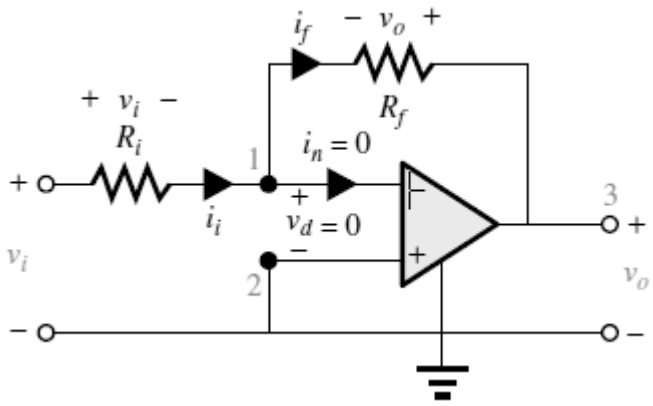



Figure 3.1

12. (a) Consider the circuit of the *noninverting amplifier* in Figure3.2, including an ideal op amp. Obtain an expression for the voltage gain of the overall circuit.
(b) Let *Ri*= 10 k*Ω* and *Rf*= 240 k*Ω* in Figure 3.2. Find the voltage gain of the overall circuit.

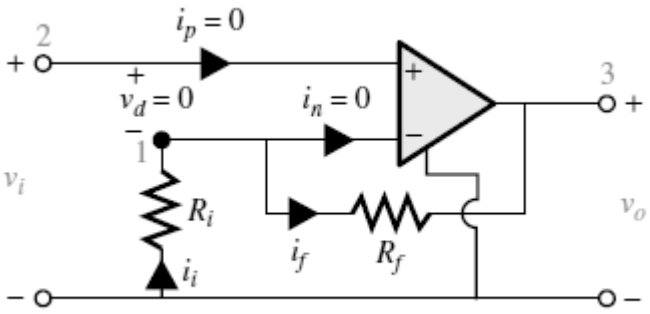



Figure 3.2

13. Find the maximum frequency of an output sine wave which can be produced at amplitude of 1.5 V if the op-amp slew rate is 0.5 V/$\mu$S.

14. Write about ideal operational amplifier with necessary circuit diagram and equations

15. Why differential amplifier is necessary?

16. Write about Differential amplifier using Op-amp with necessary circuit diagram and equations.

17. Design an Op-amp based circuit that does the following $V_O=V_1-2*V_2$.

# Chapter 4. Digital Building Blocks and computer systems.

1. Convert the following Binary numbers to Hex numbers:
   (a) $(11101110100100.100111)_2$
   (b) $(1011011101)_2$
   (c) $(0.11101)_2$
   (d) $(1101110001.11011110)_2$
   (e) $(0.0000110111000101)_2$

2. Convert the following Binary numbers to Octal numbers
   (a) $(011100010101)_2$
   (b) $(1011010)_2$
   (c) $(0.110101)_2$
   (d) $(100101111011.01011)_2$
   (e) (1110110111.1011)

3. Convert the following Hex numbers to Decimal numbers
   (a) $(6B)_{16}$
   (b) $(1F4)_{16}$
   (c) $(C59)_{16}$
   (d) $(256.72)_{16}$
   (e) $(.0E3)_{16}$

4. Give Classification of Gates and explain each gate in brief.

5. State and Explain De-Morgan's Theorem.

6. What is universal Gate? Explain with examples.

7. Define: Minterm andMaxterm.

8. Explain K-map and write down the procedure for K-map simplification.

9. Explain Half adder and Full adder with block diagram and truth table.

10. Explain the following Flip-Flops with their internal structure and timing diagram:
    a. SR Flip-Flop
    b. D Flip-Flop
    c. JK Flip-Flop
    d. Master-Slave Flip-Flop

11. Explain the following Digital System component:
    a. Decoder

b. Encoder
c. Multiplexer
d. Register

12. Show the K-map representations and reduce the following Boolean functions using SOP technique.

(a) $F(A, B, C) = \sum m_i(0, 2, 3, 5, 7)$

(b) $F(A, B, C, D) = \sum m_i(1, 3, 5, 6, 9, 10, 13, 14)$

13. Obtain a minimum Boolean expression for given function using both SOP and POS techniques.

$$F(A, B, C, D) = \sum m_i(1, 3, 4, 5, 6, 7, 10, 12)$$

14. With the use of a K map, simplify the following Boolean expressions.

(a) $F_1 = A \cdot B + \bar{B} \cdot C + A \cdot B \cdot D + A \cdot C \cdot D$

(b) $F_2 = (X + Y) \cdot (\bar{X} + Z) \cdot (Y + \bar{Z})$

15. Using K maps, simplify the following Boolean expressions:

(a) $F = A \cdot \bar{B} + A \cdot B$

(b) $F = A \cdot C + C \cdot D + B \cdot C \cdot D$

(c) $F = A \cdot B \cdot \bar{C} + B \cdot C + A \cdot B \cdot D + B \cdot C \cdot D$

16. For the switching function F = A ( $\bar{A}$ + B) draw a corresponding set of logic blocks and write the truth table.

17. Reduce the given function using K-map, F= Σm(1,3,5,9,11,13)

18. Write Short note on D flip flop with circuit diagram and truth table.

19. Classify the types of Computer network? Explain each one of them in brief.

20. For the logic expression Z = A'B + AB'
(i) Obtain the truth table.
(ii) Name the operation performed
(iii) Realize this operation using AND, OR, NOT gates
(iv) Realize Same operation using only NAND gates

21. Classify display devices.

22. Classify network topologies and draw each one of them.

23. Draw and explain microprocessor system architecture.

24. Reduce the given function using K-map. F(A,B,C,D) = Σm (1,3,5,7,8,9,13,14).

25. Write Short note on SR flip flop with circuit diagram and truth table.

26. Draw only ISO-7 layer model block diagram of an OSI for computer Networks.

27. Reduce the given Boolean expression using K-map.
    $F(A,B,C) = \Sigma m(0,2,3,5)$

28. Draw the logic symbol and truth table of following gates.
    1. AND 2. OR 3. EX-OR 4. NOR

----------END----------