Department of Pre-University Education

Government of Karnataka

Question Bank

II PUC Electronics

Disclaimer: The question bank is prepared for the benefit of students and teachers. The committee worked for the preparation of question bank made all efforts to make comprehensive and foolproof. However, if any mistakes, errors found, please mail at questionbank.pue@gmail.com, academic.pue@gmail.com. There is no guarantee that questions from this question bank only appear in the examination conducted by the department.

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Blue Print for Model Question Paper - 1

Sl. no	Name of the chapter	Knowledge (30%)				Understanding (40%)				Application/ skill (30%)				Total
		1	2	3	5	1	2	3	5	1	2	3	5	
1	FIELD EFFECT TRANSISTOR (FET)	|	|											**3**
2	TRANSISTOR BIASING			|		|								**4**
3	TRANSISTOR AMPLIFIERS						|		|				|	**12**
4	FEEDBACK IN AMPLIFIERS		|					|						**5**
5	OPERATIONAL AMPLIFIER	|			|								|	**11**
6	OSCILLATORS							|						|	**8**
7	WIRELESS COMMUNICATIONS			|											**3**
8	MODULATION AND DEMODULATION	|				|	|		|				|	**14**
9	POWER ELECTRONICS AND ITS APPLICATIONS	|					|	|				|		**9**
10	DIGITAL ELECTRONICS					|			|	|	|		|	**14**
11	MICROCONTROLLER	|			|			|						**9**
12	C PROGRAMMING	|	|						|					**8**
13	MODERN COMMUNICATION SYSTEMS			|			|							**5**
Total		**31**				**43**				**31**				**105**

II PUC- ELECTRONICS (40)

MODEL QUESTION PAPER - 1

Time: 3hour 15 min **Max. Marks: 70**

PART A

Answer ALL questions: **1 x 10 = 10**

1. Expand the term FET.
2. Which region of a transistor acts as a closed switch?
3. Mention one application of a comparator.
4. What is over modulation in AM?
5. Mention the frequency range of FM super heterodyne receiver.
6. Name the power device used in controlled rectifier?
7. Write the BCD code for $(23)_{10}$.
8. Which code is used in shift position encoders?
9. How many register banks are present in 8051?
10. What is the command to execute a program in UNIX system?

PART B

Answer any FIVE questions: **2 x 5 = 10**

11. Name two types of JFET.
12. Mention any two characteristics of a CC amplifier.
13. Mention the different types of negative feedback.
14. Draw the equivalent circuit of transmission lines for low frequency.
15. Give the reason for the presence of drift layer in a power diode.
16. Convert $(1011)_2$ into gray code using XOR gates.
17. Mention any two types of errors that occur in C programming.
18. Explain what is meant by cell splitting.

PART C

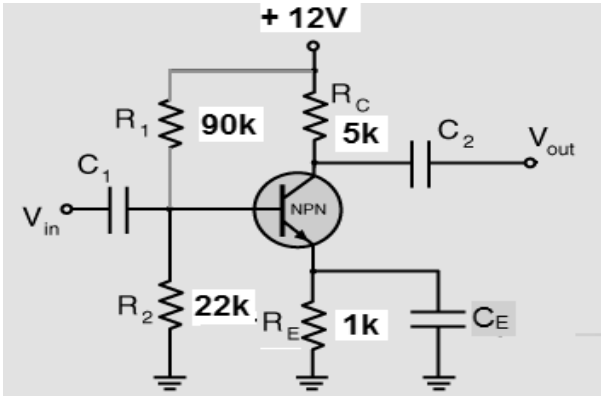
Answer any FIVE questions: **3 x 5 = 15**

19. Derive the equations to determine the coordinates of Q point in voltage divider bias.
20. With a block diagram derive an expression for output impedance of negative feedback amplifier.
21. With a circuit diagram explain the working of Wien bridge oscillator.
22. Mention the different layers of Ionosphere and explain each layer.
23. Draw the circuit diagram of single phase AC voltage controllers with input and output waveforms.
24. Determine anode current I_A of SCR when I_G=0.Given $(\alpha_1+\alpha_2)$ =0.98 and $(I_{CO1}+ I_{CO2})$ =1mA.
25. Write an assembly language program to add 05H and 0AH and store the result in R2.
26. Mention few applications of satellites.

PART D

I. Answer any THREE questions: **5 x 3 = 15**

27. Calculate the voltage gain, input impedance and output impedance in the circuit given below. Given β=100 and $r'_e = \frac{26mV}{I_E}$



28. Design an adder using an op-amp to get the output expression as $V_o = (4V_1+2V_2-5V_3)$ where R_f =10 kΩ.
29. A Colpitts oscillator oscillates at 1.13MHz. If the inductor in the feedback network has a value of 20µH and one of the capacitor values is 0.1µF. Calculate the value of the other capacitor.
30. A 10 kW carrier wave is amplitude modulated at 80% depth of modulation by a sinusoidal modulating signal. Calculate the total power and sideband power of the AM wave.
31. Simplify the Boolean expression Y=Σm (0, 2, 4, 8, 10) + Σd (11, 12, 13, 14) using K-map. Draw the NAND Gate equivalent circuit to realize the simplified equation.

II. Answer any FOUR questions: **5 x 4 = 20**

32. With a circuit diagram explain the working of class B push pull amplifier.
33. (a) Explain how an operational amplifier can be used as an integrator? 3
    (b) Mention any four characteristics of ideal Op-Amp. 2
34. Draw the block diagram of AM SHD receiver and explain the function of each block.
35. Explain the working of JK flip-flop with logic circuit. Draw its timing diagram and write its truth table.
36. (a) Why 8051 microcontroller is known as 8 bit processor? 2
    (b) Name the addressing modes of the following instructions. 3

    MOV A, R0
    MOV R0, 40H
    MOV A, @R0
37. a) Write a C program to accept the three integers and print the largest amongst them. 3
    b) Mention any four operators used in C programming. 2

Blue Print for Model Question Paper - 2

Sl. no	Name of the chapter	Knowledge (30%)				Understanding (40%)				Application/ skill (30%)				Total
		1	2	3	5	1	2	3	5	1	2	3	5	
1	FIELD EFFECT TRANSISTOR (FET)	|						|						**4**
2	TRANSISTOR BIASING	|	|											**3**
3	TRANSISTOR AMPLIFIERS								|		|		|	**12**
4	FEEDBACK IN AMPLIFIERS		|									|		**5**
5	OPERATIONAL AMPLIFIER	|	|						|				|	**12**
6	OSCILLATORS						|						|	**8**
7	WIRELESS COMMUNICATIONS	|						|						**4**
8	MODULATION AND DEMODULATION	|		|		|		|	|				**13**
9	POWER ELECTRONICS AND ITS APPLICATIONS							|	|					**8**
10	DIGITAL ELECTRONICS	|			|			|		|			|	**15**
11	MICROCONTROLLER		|			|								|	**8**
12	C PROGRAMMING		|		|	|									**8**
13	MODERN COMMUNICATION SYSTEMS			|			|								**5**
Total		**32**				**42**				**31**				**105**	

II PUC – ELECTRONICS (40)

MODEL QUESTION PAPER – 2

Time: 3hour 15 min **Max. Marks: 70**

PART A

Answer ALL questions: **1 x 10 = 10**

1. Define pinch-off voltage.
2. Define quiescent point.
3. Name any one material which exhibits piezo electric effect.
4. What is fading?
5. How many side bands are present in AM wave?
6. What is frequency modulation?
7. Define a QUAD in a K-map.
8. Convert $1111_{(2)}$ to gray code.
9. What does a 'jump' instruction do in microcontroller programming?
10. What is the value of 17%-2 in C programming?

PART B

Answer any FIVE questions: **2 x 5 = 10**

11. What is a heat sink? Mention its use.
12. Draw the frequency response of a CE amplifier.
13. Write any four characteristic features of voltage series negative feedback amplifier.
14. Name the four different modes of a differential amplifier.
15. Distinguish between damped and undamped oscillations.
16. Mention different opcodes used in 8051.
17. What is the use of main ( ) function in C?
18. Expand AMPS and TDMA.

PART C

Answer any FIVE questions: **3 x 5 = 15**

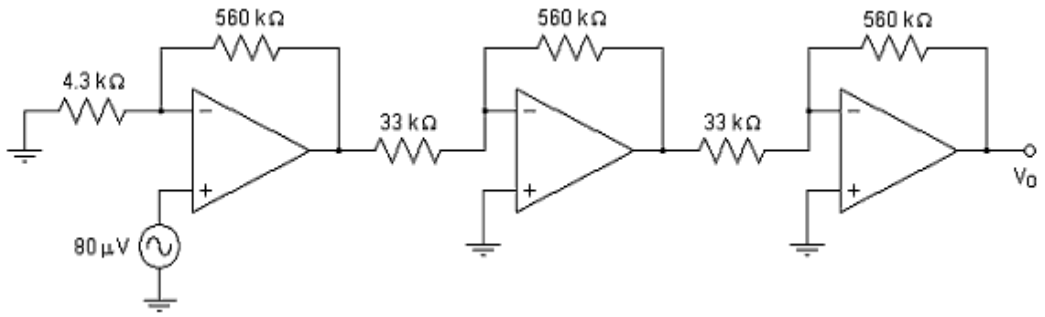
19. Give a comparison between FET and BJT.
20. Draw the frequency response of an amplifier with and without feedback and comment on the gain-bandwidth product of the amplifier.
21. Explain in brief the ground wave propagation.
22. Show that the total power in an AM wave is 3/2 times the carrier power.
23. Explain the terms sensitivity, selectivity and fidelity with respect to a radio receiver.
24. Explain briefly the working of non-punch through diode with its electric field profile diagram.
25. Write the classification of RADAR systems.
26. Draw the logic diagram of PISO register. Explain the SHIFT/$\overline{LOAD}$ action in it.

PART D

I. Answer any THREE questions: **5 x 3 = 15**

27. Calculate the voltage gain, input impedance and output impedance of a CE amplifier with I_E=1.3mA, β=100, R_C=10kΩ, R_L=10kΩ.

28. Calculate the output voltage V_o.



29. A Hartley oscillator circuit is to generate a frequency of 1200 kHz. If the capacitor in the feedback network has a value of 220 pF and one of the inductors value is 20 µH, calculate the value of the other inductor.
30. Simplify using K-map Y(A,B,C,D)=∑m(2,4,5,9,10,12,14,15)+ ∑d(0,6,8,13). Realize the simplified expression using NAND gates only.
31. Write a program to multiply two 8 bit numbers 06H and 09H at memory locations 40H and 41H respectively. Store the result at memory locations 42H (Lower Byte) and 43H (Higher Byte).

II. Answer any FOUR questions: 5 x 4 = 20

32. Give a comparison of different power amplifiers.
33. With a relevant diagram, derive an expression for the output voltage of an op-amp logarithmic amplifier.
34. Write the block diagram of digital communication and explain the function of each block.
35. What is a full adder? Explain its working with respect to three input X-OR gate and basic gates with the help of truth table and Boolean expression.
36. With circuit diagram explain the working of single phase SCR half wave rectifier with RC triggering.
37. What is a variable in C language? Mention the rules for constructing variable names in C.

Blue Print for Model Question Paper - 3

Sl. no	Name of the chapter	Knowledge (30%)				Understanding (40%)				Application/ skill (30%)				Total
		1	2	3	5	1	2	3	5	1	2	3	5	
1	FIELD EFFECT TRANSISTOR (FET)			|		|								**4**
2	TRANSISTOR BIASING	|					|							**3**
3	TRANSISTOR AMPLIFIERS		|						|				|	**12**
4	FEEDBACK IN AMPLIFIERS							|			|			**5**
5	OPERATIONAL AMPLIFIER	|	|					|					|	**11**
6	OSCILLATORS		|										|	**7**
7	WIRELESS COMMUNICATIONS					|		|						**4**
8	MODULATION AND DEMODULATION	|		|				|	|			|	**15**
9	POWER ELECTRONICS AND ITS APPLICATIONS								|			|		**8**
10	DIGITAL ELECTRONICS	|		|				|	|			|	**15**
11	MICROCONTROLLER		|		|	|								**8**
12	C PROGRAMMING	|	|						|					**8**
13	MODERN COMMUNICATION SYSTEMS			|			|							**5**
Total		**31**				**42**				**32**				**105**

II PUC ELECTRONICS (40)

MODEL QUESTION PAPER -3

Time: 3Hr 15min **Max. Marks: 70**

PART –A

Answer ALL questions: **10 x 1 = 10**

1. How many pn junctions are present in JFET?
2. Define DC load line.
3. Draw the circuit diagram of a four bit R-2R ladder network DAC.
4. Define modulation index of an AM wave.
5. How many sidebands are present in FM wave?
6. Mention one application of TRIAC.
7. Write the Boolean expression of XNOR gate.
8. Write the excess-3 code of $(304)_{10.}$
9. Which sign is used in as mnemonics for Indirect addressing mode?
10. Name the standard input and output functions used in C

PART – B

Answer any FIVE questions: **5 x 2 = 10**

11. Write the advantages of voltage divider bias circuit.
12. Mention the steps involved in drawing dc equivalent circuit of an amplifier.
13. Draw the block diagrams of voltage series negative feedback and current shunt negative feedback.
14. Expand CMRR? Give its value for ideal op-amp.
15. Explain briefly the conditions of Barkhausen criterion.
16. What is the difference between MOVC and MOVX instructions of 8051?
17. List the features of C language.
18. Distinguish between uplink and downlink signals.

PART-C

Answer any FIVE questions: **5 x 3 = 15**

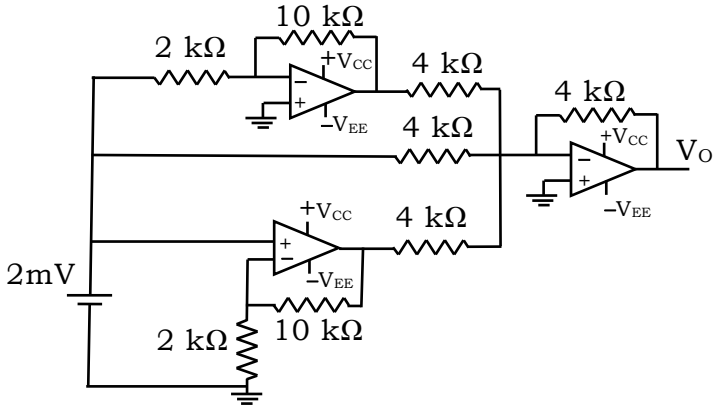
19. What are the functions of Drain, Source and Gate of JFET?
20. With a block diagram, derive an expression for input impedance of an amplifier with negative feedback.
21. Mention the characteristics of an ideal op-amp.
22. Explain the importance of ionosphere in the radio communication.
23. Briefly explain the function of an AM diode detector.
24. A silicon power diode has V_j (the drop across the p^+n^- junction) of 0.4V, R_{ON} (ohmic drop) in drift region of 0.002 Ω. Determine V_{AK} if (a) I_F = 75A and (b) I_F =100A.
25. What is half-adder? Draw the logic diagram and truth table of half adder.
26. Mention any three uses of internet.

PART-D

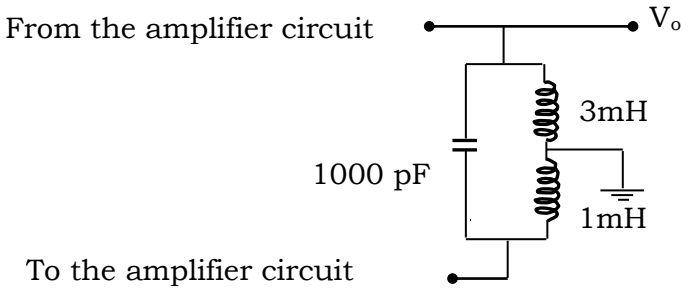
I. Answer any THREE questions: **3 x 5 = 15**

27. For a CE amplifier circuit, R_1= 33kΩ, R_2 = 10kΩ, R_C = 2.2kΩ, R_E = 1kΩ, R_L = 10kΩ, V_{CC} = 10V, β = 100, V_{BE} = 0.7V. Find I_E, $Z_{in(base)}$, Z_o and A_v and A_p. Consider $r'_e = \frac{26mV}{I_E}$

28. Calculate the output voltage in the circuit given below.



29. Calculate the frequency and feedback ratio of the circuit shown below.



30. An FM signal of amplitude 20V with single tone modulation has a frequency deviation of 15 kHz and a band width of 40 kHz. Find the frequency of the modulating signal, modulation index and carrier swing. Write the expression of FM wave.
31. Simplify the expression using K-map and draw the logic diagram for the simplified expression using NAND gates, given Y (A, B, C, D) = ∑m(1,4,5,7,12,14,15) + ∑d(3,6,13)

II. Answer any FOUR questions: 4 x 5 = 20

32. With a circuit diagram explain the working of CB amplifier. Draw the input and output wave forms. Mention one application.
33. Explain FM transmitter with a block diagram.
34. With a sketch explain the two transistor model of SCR. Derive an equation for anode current for zero gate current.
35. Explain the working of Clocked RS flip-flop using NAND gates. Write its truth table and timing diagram.
36. Write a program to add the values of locations 40H and 41H and store the result in locations 50H and 51H.
37. Write the basic structure of C program and explain each section in brief.

CHAPTERWISE QUESTIONBANK

Chapter 1
FIELD EFFECT TRANSISTOR (FET)

One mark questions (knowledge)

1. What is FET?
2. Expand JFET.
3. Expand MOSFET.
4. Expand IGFET.
5. Name the terminals of FET.
6. What are the two main types of FET?
7. What is n-channel JFET?
8. What is p-channel JFET?
9. Name the charge carrier in n-channel JFET.
10. Name the charge carrier in p-channel JFET.
11. Define dc drain resistance of JFET.
12. Define amplification factor of JFET.
13. What is the function of the gate in JFET?
14. What is the function of source in JFET?
15. What is the function of drain in JFET?
16. What is drain characteristics in JFET?
17. What are transfer characteristics in JFET?
18. What is drain resistance in JFET?
19. What is transconductance in JFET?
20. What is amplification factor in JFET?
21. Mention the SI unit of transconductance in JFET.

One mark questions (understanding)

1. Is JFET unipolar or bipolar device?
2. Is JFET a current controlled device or a Voltage controlled device?
3. How many pn junctions are present in JFET?
4. What is the value of drain current at pinch off condition?
5. What happens to the depletion regions when the gate reverse bias is increased?
6. How does the channel of JFET act like when no voltage is applied to the gate?
7. Name the two characteristics of JFET.
8. Write any one characteristic feature of JFET.

One mark questions (skill)

1. Draw the symbol of n-channel JFET.
2. Draw the symbol of p-channel JFET.

Two mark questions (knowledge)

1. Mention the types of MOSFET.
2. Define ac drain resistance in JFET. Write its expression.

3. Define transconductance in JFET. Write its expression.
4. What is I_{DSS}? Write the relation between I_D and I_{DSS}.

Two mark questions (understanding)

1. Expand FET and MOSFET.
2. Define pinch off voltage in JFET.
3. What is the function of drain and gate in JFET?
4. Write any two differences between JFET and BJT.
5. Explain the terms r_d and g_m.
6. What happens to the width of the depletion layer when the gate is reverse biased?
7. What is amplification factor in JFET? Write its relation with r_d and g_m.
8. Mention any two advantages of FET over BJT.
9. Write Shockley's current equation and explain the notations used.

Two mark questions (skill)

1. Draw the circuit symbol of n-channel JFET and name the terminals.
2. Draw the circuit symbol of p-channel JFET and name the terminals.
3. Draw the drain characteristics of n-channel JFET.
4. Draw the transfer characteristics of n-channel JFET.
5. Draw the circuit to study the characteristics of n-channel JFET.

Three mark questions (knowledge)

1. What are the functions of drain, source and gate of JFET?
2. Explain drain characteristics with its graphical representation.

Three mark questions (understanding)

1. Mention any three advantages of JFET over BJT.
2. Briefly explain the construction of n-channel FET.
3. Briefly explain the working of n-channel JFET with a relevant diagram.
4. Derive the relation $\mu = r_d \times g_m$.
5. Explain the formation of depletion region in JFET due to drain source voltage.
6. Explain the formation of depletion region in JFET due to gate potential.
7. Explain the advantages and disadvantages of a JFET.
8. With a circuit diagram explain the different regions of drain characteristic for $V_{GS}=0$.

Three mark questions (skill)

1. Sketch and explain a typical transfer characteristic for an n-channel JFET.

Problems:

1. A JFET has $g_m= 1500\mu S$ and $r_d= 5K\Omega$ determine its μ. (Ans: $\mu=7.5$)

2. An n-channel JFET rated with values of I_{DSS} = 10mA and V_p=-3.5V is operated with I_D measured to be 3.265mA. What is the value of V_{GS}? (Ans: V_{GS}= -1.5v)
3. The pinch of voltage of FET is -3V and drain saturation current is 40mA. If the gate to source voltage is -2V and drain to source voltage is 4V, determine its drain current, transconductance and DC drain resistance. (Ans: I_D=6.66 m A, g_m=3.33ms, r_d=600.6Ω)

Chapter 2

Bipolar Junction Transistor (BJT) Biasing

One mark questions (knowledge)

1. Define operating point.
2. What is DC load line?
3. Define quiescent point.
4. What is leakage current in BJT?
5. Write the relation between I_{CBO} and I_{CEO}.
6. What is thermal run away?
7. Define stability factor in BJT.
8. What is heat sink?

One mark questions (understanding)

1. What is meant by transistor biasing?
2. Why transistor is called as a current controlled device?
3. Name the two end points of the DC load line.
4. What is the value of V_{CE} at saturation point?
5. What is the value of I_C at cut off point?
6. Where should the Q point be located for the transistor to be operated as an amplifier?
7. Write the expression for DC load line of a transistor in CE configuration?
8. For the BJT to work as a closed switch where should the operating point be located on the DC load line?
9. For the BJT to work as an open switch where should the operating point be located on the DC load line?
10. Mention the transistor parameter that is temperature dependent.
11. Mention any one leakage current in a transistor.
12. Name any one biasing method for a transistor.
13. Name the biasing circuit which gives excellent stabilization.

Two mark questions (knowledge)

1. What are the biasing conditions for a transistor to be used as an amplifier?
2. Mention any two types of biasing methods.
3. What is leakage current? Mention different types of leakage currents.

Two mark questions (understanding)

1. What is the need for biasing a transistor?
2. Write the advantages of voltage divider bias circuit.
3. What is a heat sink? Mention its importance.

Two mark questions (skill)

1. Sketch the transistor output characteristics in CE mode. Indicate different regions of the characteristics.
2. Draw the biasing arrangement for an npn transistor in CE configuration with two sources.
3. Draw the DC load line on the output characteristics of a CE amplifier.

4. Draw the circuit diagram of a Voltage divider bias circuit.

Three mark questions (knowledge)

1. What is Q point? Explain its significance.
2. What is meant by stability factor? Mention the factors affecting it.

Three mark questions (understanding)

1. What is transistor biasing? Explain the need for biasing.
2. Derive an expression for the DC load line for a transistor in CE mode biased with two sources.
3. What is voltage divider bias? Mention its advantages.
4. Explain the leakage currents in CE and CB configurations.

Problems:

1. A transistor connected in CE mode in which collector supply is 8V and voltage drop across R_C = 800Ω connected in the collector circuit is 0.5V. If α = 0.96 determine V_{CE} and I_B.
2. A transistor has β = 100 and I_{CBO} = 5μA when it is connected in a circuit as a CE stage with zero load resistance, the collector current I_C = 1mA. Calculate the values of I_B, I_E and α.
3. For the given parameters values of voltage divider biasing circuit, determine the end points of the dc load line and draw the DC load line R_1=56KΩ, R_2=10KΩ, R_C=2.2KΩ, R_E=1KΩ and V_{CC}=12V.

Chapter 3
Transistor Amplifiers

One mark questions (knowledge)

1. What is an amplifier?
2. Define amplification.
3. What is faithful amplification?
4. What is the function of coupling capacitor in an amplifier?
5. What is meant by small signal amplifier?
6. What is meant by large signal amplifier?
7. Define voltage gain of an amplifier?
8. Write an expression for voltage gain in dB.
9. What is power gain?
10. Write the expression for power gain in dB.
11. Define bandwidth of an amplifier.
12. Mention the unit of bandwidth.
13. What is meant by frequency response of an amplifier?
14. What is buffer amplifier?
15. What is cascaded amplifier?
16. What is a power amplifier?
17. Write the expression for efficiency of power amplifier.
18. What is an RF amplifier?
19. What is meant by a single stage amplifier?
20. What is meant by multistage amplifier?
21. Define class A operation.
22. Define class B operation.
23. Define class AB operation.
24. Define class C operation.
25. Name the power amplifier whose operating point lies exactly at the center of the dc load line.
26. Name the power amplifier whose operating point lies exactly at the cut-off point on dc load line.
27. Name the power amplifier whose operating point lies slightly above the cut-off point on dc load line.
28. Name the power amplifier whose operating point lies slightly below the cut-off point on dc load line.

One mark questions (understanding)

1. Which amplifier is called as a unity gain amplifier?
2. Name the amplifier which has the highest current gain.
3. Which transistor amplifier has a phase shift of 180^0 between input and output signals?
4. Why is the CC amplifier called as an emitter follower?
5. Which transistor amplifier has voltage gain less than unity?
6. What is the function of bypass capacitor in amplifiers?
7. Mention the importance of dc equivalent circuit in the analysis of an amplifier.
8. Which equivalent circuit is used to derive the amplifier parameters?
9. Write the expression of voltage gain using r'_e model by considering the load resistor R_L.

10. Where is the operating point of class A operation located?
11. Where is the operating point of class B operation located?
12. Where is the operating point of class AB operation located?
13. Where is the operating point of class C operation located?
14. Which power amplifier has the highest power efficiency?

One mark questions (skill)

1. Sketch the graph showing cross-over distortion in push pull amplifier.
2. Draw the frequency response curve of direct coupled CE amplifier.

Two mark questions (knowledge)

1. Define the terms amplification and amplifier.
2. Define small and large signal amplifiers.
3. Define voltage gain and current gain of an amplifier.
4. Write the expression of voltage gain and power gain in decibels?
5. Define input impedance and output impedance of an amplifier.
6. What is frequency response of an amplifier? Define bandwidth of an amplifier.
7. Mention the steps involved in drawing dc equivalent circuit of an amplifier.
8. Mention the steps involved in drawing ac equivalent circuit of an amplifier.
9. Mention any two characteristics of CC amplifier.
10. Mention any two characteristics of CE amplifier.
11. Mention any two characteristics of CB amplifier.
12. Mention the disadvantages of direct coupled amplifier?
13. Write the advantages of RC coupled amplifier?
14. What is cascading? Mention any one type of cascading.

Two mark questions (understanding)

1. Why do we prefer to express the gain in decibel?
2. Classify amplifiers based on operating point.
3. Explain the factors affecting the gain at low and high frequencies.
4. Why is CE amplifier most commonly used in electronic circuits?
5. Explain the functions of the coupling and bypass capacitors?
6. Why the gain of a CE amplifier decreases at very low frequencies?
7. Why the gain of a CE amplifier decreases at very high frequencies?
8. Why the gain of a CE amplifier remains constant at mid frequencies?
9. Distinguish between voltage amplifiers and power amplifiers.
10. Why is the power amplifier called as a large signal amplifier?
11. Explain cross-over distortion in power amplifier.

Two mark questions (skill)

1. Draw the DC equivalent circuit for a single stage CE amplifier using voltage divider biasing.
2. Draw the circuit diagram of a single stage CE amplifier using voltage divider bias along with its input and output waveforms.
3. Draw the circuit diagram of CB amplifier with its input and output waveforms.
4. Draw the circuit diagram of a CC amplifier, show its input and output waveforms.

5. Draw the circuit diagram of a common source JFET along with its input and output waveforms.
6. Draw the ac equivalent circuit for a single stage CE amplifier using voltage divider biasing.
7. Draw the r'_e model of the transistor in CE mode.
8. Draw the frequency response of CE amplifier. Mention the expression for bandwidth.
9. Draw the circuit diagram of a class B push pull power amplifier.
10. Draw the circuit diagram of collector tuned class C power amplifier.
11. With the help of the wave form explain cross over distortion.
12. In a CE amplifier circuit $R_C = 3.3K\Omega$ and $R_L = 4.7K\Omega$. Calculate the output impedance.
13. If the ac resistance of the emitter diode is 50Ω, $R_C = 20K\Omega$ and β of the transistor is 70, calculate the power gain and voltage gain of an amplifier.
14. Calculate the voltage gain of a CE amplifier if the value of R_C is $2.2K\Omega$, R_L is $3.3K\Omega$ and r'_e is 52Ω.

Three mark questions (knowledge)

1. Define the input impedance, output impedance and current gain of an amplifier.
2. Define class A, class B and class C power amplifiers.

Three mark questions (understanding)

1. Compare CE, CB and CC amplifier with respect to voltage gain and phase relation.
2. Compare CE, CB and CC amplifier with respect to input and output impedance.
3. Derive the expression for voltage gain and output impedance of single stage CE amplifier with r'_e model.
4. Derive the expressions for power gain and input impedance of single stage CE amplifier using r'_e model.
5. Explain in brief the frequency response of a single stage CE amplifier.
6. Write any three differences between the voltage amplifiers and power amplifiers.

Three mark questions (skill)

1. Draw the graphical representation and amplification for small signal by choosing Q point near active region.

Five mark questions (knowledge)

1. Write the procedure involved in obtaining AC and DC equivalent circuits of voltage divider biasing CE amplifier. Write the AC equivalent circuit.
2. What is a cascaded amplifier? What is the need for cascading? Obtain an expression for overall voltage gain of a cascaded amplifier.

Five mark questions (understanding)

1. Compare CE, CB and CC amplifiers.
2. With a circuit diagram describe the working of a CB amplifier and draw its input and output waveforms.
3. Explain the working of CE amplifier with a circuit diagram using voltage divider bias and draw its input and output waveforms.
4. Explain the working of CC amplifier with a circuit diagram and draw input and output waveforms.

5. Explain the working of common source JFET amplifier with its circuit diagram and draw input and output waveforms.
6. Explain with a circuit diagram the working of class B push pull power amplifier.
7. Explain with the circuit diagram, the working of Direct coupled CE amplifier. Draw the frequency response.
8. With a circuit diagram explain the working of two stage RC coupled CE amplifier. Draw its frequency response curve.

Five mark questions (skill)

1. With a circuit diagram describe the working of a CB amplifier and draw its input and output waveforms.
2. Explain the working of CE amplifier with a circuit diagram using voltage divider bias and draw its input and output waveforms.
3. With a circuit diagram describe the working of push-pull amplifier and draw its input and output waveforms.

Problems:

1. A three stage amplifier has a first stage voltage gain of 10, second stage voltage gain of 50 and third stage voltage gain of 400. If the input voltage given at the first stage of amplifier is 10μV, calculate the output of each stage. Also find the total voltage gain in dB.

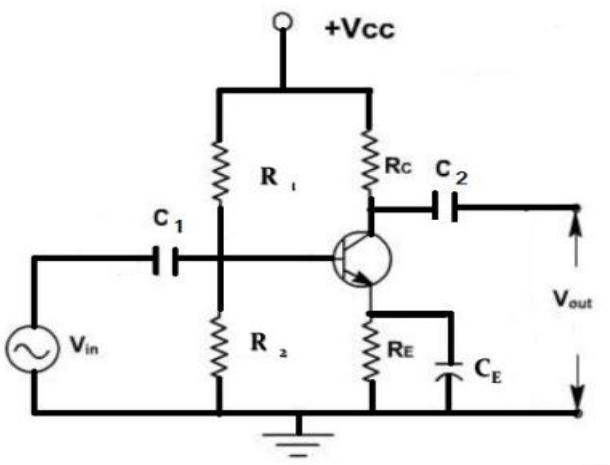
   (Ans: V_{o1}=0.1mV, V_{o2}=5mV, V_{o3}=2V, A_v dB = 106.02 dB)

2. Find the voltage gain and input resistance of a single stage CE amplifier if V_{CC} = 18V, R_1 = 47 KΩ, R_2 = 12KΩ, R_C = 3.3 KΩ, R_E = 1000 Ω, R_L = 10KΩ, β=100, V_{BE} = 0.3 V and r'_e= 52mV/I_E.

   (Ans: Z_{IN}= 1.33 KΩ and A_V=160)

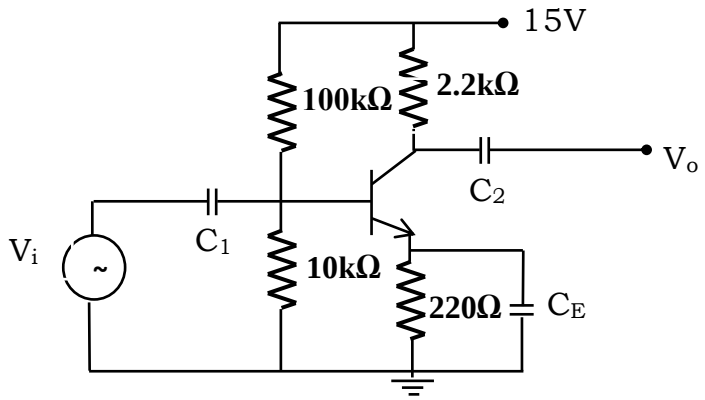
3. For the circuit given below R_1 = 100KΩ, R_2 = 10KΩ, R_c = 2.2KΩ, R_E =220Ω, V_{CC} = 15V, I_E=3.41mA and β = 100, calculate the voltage gain, r'_e, power gain, A_V in dB and A_P in dB.

   (Ans: A_V= 288.7, r'_e= 7.62 Ω, A_P= 28870, A_V in dB = 49.20dB and A_P in dB = 44.60dB)



4. For the CE amplifier circuit using silicon transistor given below, find
i) voltage across 10kΩ ii) I_E iii) r'_e iv) A_v v) A_i . Given β=100, V_{BE} = 0.3 and $r'_e = \frac{26mV}{I_E}$.

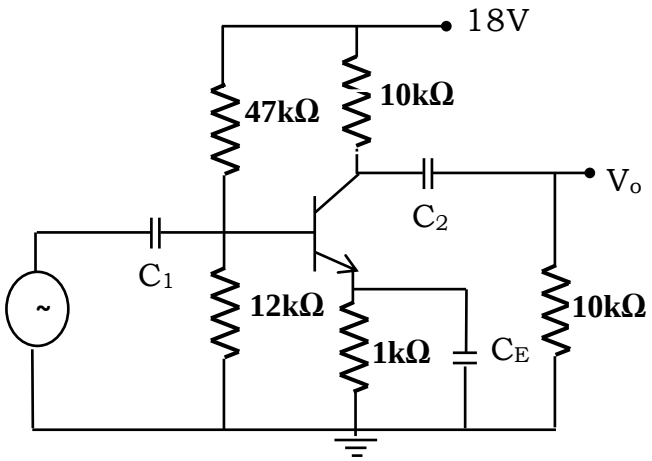
Ans (i) V_{10k} = 1.36V, ii) I_E = 3mA, iii) $r_e{}^1$ = 8.67Ω iv) A_v = -253.8 v) A_i =100)



5. CE amplifier circuit using Germanium transistor is shown in figure, calculate
i) voltage across 12 kΩ ii) I_E , iii) $Z_{in\ (base)}$ iv) A_v v) Z_o.

Given: $r'_e = \frac{52mV}{I_E}$, V_{BE} = 0.3 and β=150.

Ans (i) V_{12k} = 3.66V ii) I_E =3.36mA iii) $Z_{in(\ base)}$= 2.32kΩ iv) A_v = - 323.2 *v*) Z_o = 5k Ω)



6. If an amplifier is provided with input voltage of 5mV, the maximum voltage gain is 2000 for signal frequency of 2 KHz. It falls to 1414 at 10 KHz and 50Hz. Find the output voltage, gain in dB, upper cut-off frequency, lower cut-off frequency and bandwidth.

(Ans: V_O=10V, A_{Vmax} in dB= 66.02dB, f_L= 50 Hz, f_H= 10 KHz and BW= 9.95 KHz)

7. A three-stage amplifier has a first stage voltage gain of 100, second stage voltage gain of 200 and third stage voltage gain of 400. Find the total voltage gain in dB.

(Ans: 138dB)

Chapter 4
Feedback in Amplifiers

One mark questions (knowledge)

1. What is feedback?
2. Mention the types of feedback.
3. Define positive feedback.
4. Define negative feedback.
5. Define feedback factor.
6. Define open loop gain.
7. Define closed loop gain.
8. What is meant by loop gain?
9. Write the expression for the gain of an amplifier with positive feedback.
10. Write the expression for the gain of an amplifier with negative feedback.
11. Write the expression for the input impedance of an amplifier with negative feedback.
12. Write the expression for the output impedance of an amplifier with negative feedback.
13. Write the expression for the upper cut-off frequency of an amplifier with negative feedback.
14. Write the expression for the lower cut-off frequency of an amplifier with negative feedback.
15. Name the type of feedback that is preferred for an amplifier.
16. Which type of feedback is required in an oscillator?
17. What is the effect of negative feedback on bandwidth of an amplifier?
18. What happens to the input impedance of the amplifier when voltage series negative feedback is applied?
19. What happens to the output impedance of the amplifier when voltage series negative feedback is applied?
20. What is the effect of negative feedback on gain stability of an amplifier?
21. Which type of negative feedback decreases both input and output impedance of an amplifier?
22. What kind of negative feedback decreases input impedance and increases output impedance?
23. What is the effect of negative feedback on the gain bandwidth product of the amplifier?
24. Mention the only disadvantage of negative feedback.

One mark questions (understanding)

1. What happens to the voltage gain of an amplifier when negative feedback is applied?
2. What happens to the input impedance of an amplifier when negative feedback is applied?
3. Which type of feedback is required to reduce distortion in an amplifier?

One mark questions (skill)

1. Draw the block diagram of voltage series negative feedback.
2. Draw the block diagram of voltage shunt negative feedback.
3. Draw the block diagram of current series negative feedback.
4. Draw the block diagram of current shunt negative feedback.

Two mark questions (knowledge)

1. Name the type of feedback used in an amplifier and an oscillator.
2. Mention the advantages of negative feedback.
3. Mention the different types of negative feedback.
4. Mention the disadvantages of positive feedback.
5. Write the expressions for the gain and bandwidth of an amplifier using negative feedback.
6. Write the expressions for the input impedance and output impedance using negative feedback.
7. Write the expressions for the lower cutoff frequency and upper cutoff frequency of an amplifier using negative feedback.
8. Write the expressions for the noise and distortion of an amplifier using negative feedback.

Two mark questions (understanding)

1. Distinguish between open loop and closed loop gain.
2. Distinguish between positive feedback and negative feedback.
3. Explain the effect of positive and negative feedback on the gain of an amplifier.
4. Positive feedback is seldom used in amplifier, why?
5. Explain gain bandwidth product of an amplifier.

Two mark questions (skill)

1. Draw the block diagrams of voltage series negative feedback and current shunt negative feedback.
2. Draw the block diagrams of current series negative feedback and voltage shunt negative feedback.
3. Draw the frequency response curve of an amplifier with and without negative feedback.

Three mark questions (knowledge)

1. Explain the terms feedback ratio, loop gain and closed loop gain.
2. What is meant by gain stability of a negative feedback amplifier? Explain the effect of negative feedback on gain stability of an amplifier.

Three mark questions (understanding)

1. With a block diagram, derive an expression for output impedance of an amplifier with negative feedback.
2. With a block diagram, derive an expression for voltage gain of an amplifier with negative feedback.
3. With a block diagram, derive an expression for input impedance of an amplifier with negative feedback.
4. Derive an expression for gain stability of an amplifier with negative feedback.

Three mark questions (skill)

1. Draw the frequency response curve of an amplifier with and without feedback. Write the expression for the bandwidth of an amplifier with negative feedback.

PROBLEMS:

1. Calculate the gain of a negative feedback amplifier with an open loop gain A=250 and feedback factor β=0.1. (Ans= 9.65)
2. In a negative feedback amplifier if A=1000 and β=0.04, find the gain with feedback.

   (Ans= 24.39)
3. An amplifier of gain 600 reduces to 50 after negative feedback. Calculate the feedback fraction.

   (Ans= 0.0183 or 1.83%)
4. If an amplifier has a bandwidth of 500 Hz and voltage gain of 100. What will be the new bandwidth if 6% negative feedback is introduced?

   (Ans= 3500kHz)
5. In an amplifier upper cut-off frequency is 1000 kHz and open loop gain is 100. Determine upper cut-off frequency when 2% negative feedback is introduced.

   (Ans= 3000kHz)
6. In an amplifier lower cut-off frequency is 500 Hz and open loop gain is 100. Determine lower cut-off frequency when 5% negative feedback is introduced.

   (Ans= 83.3Hz)
7. An amplifier with Z_i= 1kΩ has a voltage gain A= 1000. If a negative feedback of β=0.01 is applied. Calculate the input impedance of the negative feedback amplifier.

   (Ans= 11KΩ)
8. An amplifier with Z_O= 10kΩ has a voltage gain A=500. If a negative feedback of β=0.01 is applied. Calculate the input impedance of the negative feedback amplifier.

   (Ans= 1.6 KΩ)
9. An amplifier has a bandwidth of 220 kHz and voltage gain of 100. Calculate the gain and bandwidth if 10% negative feedback is introduced.

   (Ans= 2420kHz)
10. An amplifier has an output impedance of 3kΩ without feedback and 300Ω with feedback. If the open loop gain is 180 find the feedback factor.

    (Ans= 0.05 or 5%)
11. The input impedance of an amplifier is 2kΩ while its output impedance with and without feedback is 150Ω and 5kΩ. If the open loop gain of the amplifier is 500, calculate the input impedance with feedback.

    (Ans= 66.6kohm)
12. The output impedance of an amplifier is 5kΩ while its input impedance with and without feedback is 15kΩ and 5kΩ. If the open loop gain of the amplifier is 100 calculate the gain with feedback.

    (Ans= 33.3)

Chapter 5
Operational Amplifier

One mark questions (knowledge)

1. What is a differential amplifier?
2. What is an op-amp?
3. Draw the pin configuration of IC-741.
4. Write any one ideal characteristics of op-amp.
5. Define input offset voltage.
6. Define CMRR of an op-amp.
7. Mention the CMRR value of an ideal op-amp.
8. Define slew rate of an op-amp.
9. Mention the unit of slew rate.
10. Mention any one linear application of op-amp
11. Mention any one non-linear application of op-amp.
12. What is the phase difference between the input and output of an inverting op amp?
13. What is the phase difference between the input and output of a non-inverting op amp?
14. What is the advantage of using op-amp as a buffer?
15. Write an expression for output voltage of three input inverting op-amp adder when V_1, V_2 and V_3 are the inputs given to it. Consider that all the resistors used are identical.
16. Write an expression for output voltage of three input op-amp adder when V_1, V_2 and V_3 are the inputs given to it, considering the resistors used are of different values.
17. Write an expression for output voltage of an op-amp subtractor when V_1 is given to inverting terminal and V_2 is given to non-inverting terminal. Consider that all the resistors used are identical.
18. Write the expression for output voltage of op-amp subtractor when $V_1$is given to inverting terminal and V_2 is given to non-inverting terminal, considering the resistors used are of different values.
19. What is an op-amp differentiator?
20. Write an expression for output voltage of an op-amp differentiator.
21. What is an op-amp integrator?
22. Write the expression for output voltage of an op-amp integrator.
23. What is an op-amp logarithmic amplifier?
24. Write an expression for output voltage of an op-amp logarithmic amplifier.
25. Mention any one application of an op-amp logarithmic amplifier.
26. What is an op-amp anti-logarithmic amplifier?
27. Write the expression for output voltage of an op-amp anti-logarithmic amplifier.
28. Write any one application of an op-amp anti-logarithmic amplifier.
29. What is an op-amp active filter?
30. Write an expression for cut off frequency of an op-amp first order low pass active filter.
31. Write the expression for cut-off frequency of an op-amp first order high pass active filter.
32. What is a digital to analog converter?
33. What is an analog to digital converter?
34. Name any one open loop application of an op-amp.
35. What is an op-amp comparator?
36. What is a Schmitt Trigger?

37.Why Schmitt Trigger is known as square wave generator?
38.What type of feedback is used in Schmitt Trigger?
39.Name any one application of Schmitt Trigger.

One mark questions (understanding)

1. Why is input current drawn by an ideal op-amp zero?
2. When does a comparator produce zero output?

One mark questions (skill)

1. Draw the circuit symbol of an op-amp.
2. Draw the circuit diagram of an op-amp subtractor.
3. Draw the circuit diagram of an op-amp differentiator.
4. Sketch the output of an op-amp differentiator if the input is a square wave.
5. Sketch the output of an op-amp differentiator if the input is a sine wave.
6. Draw the circuit diagram of an op-amp integrator.
7. Write the expression for output voltage of an op-amp integrator.
8. Sketch the output of an op-amp integrator if the input is a sine wave.
9. Sketch the output of an op-amp integrator if the input is a square wave.
10. Draw the circuit diagram of an op-amp logarithmic amplifier.
11. Draw the circuit diagram of an op-amp anti-logarithmic amplifier.
12. Draw the circuit diagram of an op-amp first order low pass active filter.
13. Draw the frequency response curve of an op-amp low pass active filter.
14. Draw the circuit diagram of an op-amp high pass active filter.
15. Draw the frequency response curve for an op-amp first order high pass active filter.

Two mark questions (knowledge)

1. Name the different modes of a differential amplifier.
2. Mention the characteristics of an ideal op-amp.
3. Expand CMRR? Give its value for ideal op-amp.
4. Define CMRR. What is its importance?
5. With a circuit diagram briefly explain virtual ground concept of an op-amp.
6. What is an op amp buffer? Draw its circuit diagram.
7. Mention the types of digital to analog converters.
8. Mention any two applications of op amp comparator?
9. Draw the circuit diagram of an op-amp Schmitt trigger.

Two mark questions (understanding)

1. Why is an op-amp so called?
2. Distinguish between inverting and non-inverting operational amplifier.

Two mark questions (skill)

1. Draw the block diagram of an op-amp.
2. Draw the circuit diagram of an op-amp logarithmic amplifier and write the expression for its output voltage.
3. Draw the circuit diagram of an op-amp anti-logarithmic amplifier and write the expression for its output voltage.
4. Draw the circuit diagram of a four bit R-2R ladder network DAC.
5. Draw the circuit diagram of four bit binary weighted resistor DAC.

Three mark questions (knowledge)

1. Mention the characteristics of an ideal op-amp.
2. With a circuit diagram derive an expression for the output of an op-amp logarithmic amplifier.
3. With a circuit diagram derive an expression for the output of an op-amp anti-logarithmic amplifier.
4. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC low pass active filter.
5. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC high pass active filter.

Three mark questions (understanding)

1. Mention the characteristics of an ideal op-amp.
2. Draw the circuit diagram of an op amp inverting amplifier and derive an expression for its voltage gain.
3. Draw the circuit diagram of an op-amp non-inverting amplifier and derive an expression for its voltage gain.
4. Draw the circuit diagram of a three input inverting op-amp summing amplifier and derive an expression for its output voltage.
5. Draw the circuit diagram of an op-amp subtractor and derive an expression for its output voltage.
6. Draw the circuit diagram of an op-amp differentiator and derive an expression for its output voltage.
7. Draw the circuit diagram of an op-amp integrator and derive an expression for its output voltage.
8. With a circuit diagram derive an expression for the output of an op-amp logarithmic amplifier.
9. With a circuit diagram derive an expression for the output of an op-amp anti-logarithmic amplifier.
10. Draw the block diagram of the counting type analog to digital converter.
11. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC low pass active filter.
12. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC high pass active filter.

Three mark questions (skill)

1. Mention the characteristics of an ideal op-amp.
2. Draw the circuit diagram of an op amp inverting amplifier and derive an expression for its voltage gain.
3. Draw the circuit diagram of an op-amp non-inverting amplifier and derive an expression for its voltage gain.

4. Draw the circuit diagram of a three input inverting op-amp summing amplifier and derive an expression for its output voltage.
5. Draw the circuit diagram of an op-amp subtractor and derive an expression for its output voltage.
6. Draw the circuit diagram of an op-amp differentiator and derive an expression for its output voltage.
7. Draw the circuit diagram of an op-amp integrator and derive an expression for its output voltage.
8. With a circuit diagram derive an expression for the output of an op-amp logarithmic amplifier.
9. With a circuit diagram derive an expression for the output of an op-amp anti-logarithmic amplifier.
10. Draw the block diagram of the counting type analog to digital converter.
11. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC low pass active filter.
12. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC high pass active filter.

Five mark questions (Understanding)

1. Write the block diagram of an op-amp and explain each block in brief.
2. What are active filters? Give its classification. Draw the circuit diagram, frequency response and expression for cut-off frequency for an op-amp first order RC high pass filter.
3. What is an op amp summing amplifier? Draw the circuit diagram of a three input inverting op-amp adder and derive an expression for its output voltage.
4. What is an op amp subtractor? Draw the circuit diagram of an op-amp subtractor and derive an expression for its output voltage.
5. What is an op amp differentiator? Draw the circuit diagram of an op-amp differentiator and derive an expression for its output voltage.
6. What is an op amp integrator? Draw the circuit diagram of an op-amp integrator and derive an expression for its output voltage.
7. What is an op amp logarithmic amplifier? With a circuit diagram derive an expression for the output of an op-amp logarithmic amplifier.
8. What is an op amp anti-logarithmic amplifier? With a circuit diagram derive an expression for the output of an op-amp anti-logarithmic amplifier.

Problems:

1. If common mode gain and differential mode gain for a differential amplifier are 0.1 and 500 respectively, find CMRR in dB.

   (Ans: 74)
2. In an inverting amplifier, the input voltage is 0.5V and the output voltage is 2V. If the input resistance of the amplifier is 1.2 kΩ. Calculate the feedback resistance.

   (Ans:4.8kΩ)
3. In an inverting amplifier, the input voltage is 3V and the output voltage is 6V. If the feedback resistance of the amplifier is 10 kΩ. Calculate the input resistance.

   (Ans: 5 kΩ)
4. Calculate the output voltage of an inverting amplifier using an input resistance of 2.2 kΩ and feedback resistance of 6.8 kΩ when the input voltage is 0.2V.

   (Ans:0.62V)

5. Calculate the input voltage of an inverting amplifier using an input resistance of 100 Ω and feedback resistance of 120 Ω when the output voltage is 6V.

(Ans: 5V)

6. In a non-inverting amplifier, the input voltage is 0.5V and the output voltage is 2V. If the input resistance of the amplifier is1.2 kΩ. Calculate the feedback resistance.

(Ans: 3.6kΩ)

7. In a non-inverting amplifier, the input voltage is 2V and the output voltage is 6V. If the feedback resistance of the amplifier is 10 kΩ, calculate the input resistance.

(Ans: 5 kΩ)

8. Calculate the output voltage of a non-inverting amplifier using an input resistance of 120 Ω and feedback resistance of 180 Ω when the input voltage is 0.5V.

(Ans: 1.25V)

9. Calculate the input voltage of a non-inverting amplifier using an input resistance of 1.2 kΩ and feedback resistance of 1.8 kΩ when the output voltage is 6V.

(Ans: 2.4V)

10. Calculate the gain of a non-inverting amplifier, if R_f =1.8 kΩ and R_i = 1.2 kΩ.

(Ans: 2.5)

11. Calculate the gain of an inverting amplifier, if R_f =18 kΩ and R_i = 12 kΩ.

(Ans: -1.5)

12. The input signals to an adder circuit are 3mV, 6mV and 18mV through resistors of 120 Ω, 150 Ω and 180 Ω respectively. Find the value of feedback resistor to get an output of 50 mV.

(Ans: 303.03 Ω)

13. The input signals to an adder circuit are 6 mV, -3 mV and 9 mV through resistors of 1.2 kΩ, 1.5 kΩ and 1.8 kΩ respectively. Find the output voltage if the feedback resistance is 10 kΩ.

(Ans: 80mV)

14. Design an op-amp adder, if the output voltage $V_o = -(0.1V_1 + 0.4V_2 + 0.02V_3)$. Assume R_f = 22 kΩ.

(Ans: 220 kΩ, 55 kΩ, 1.1MΩ)

15. Determine the output voltage of op-amp subtractor when 4V input is given to inverting terminal and 2V input is given to non-inverting terminal. Consider all the resistors used are of same value.

(Ans: -2V)

16. Determine the output voltage of op-amp subtractor when 5V input is given to inverting terminal and 8V input is given to non-inverting terminal. Consider all the resistors used are of same value.

(Ans: 3V)

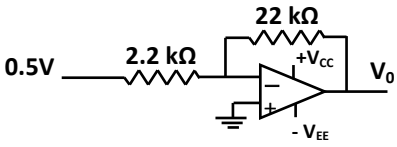
17. Determine the output voltage of 3 input op-amp adder when 0.5V, -2V and 5V are the inputs given to it. Consider all the resistors used are of same value.

(Ans: 3.5V)

18. Determine the output voltage of 3 input op-amp adder when 1.5V, 4V and 2V are the inputs given to it. Consider all the resistors used are of same value.

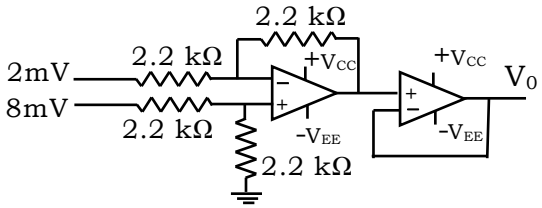
(Ans: 7.5V)

19. Calculate the output voltage for the circuit shown below.



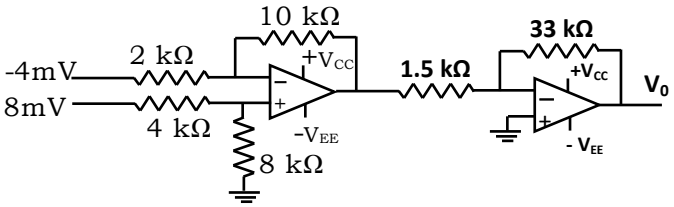
(Ans: - 5V)

20. Calculate the output voltage for the circuit shown below.



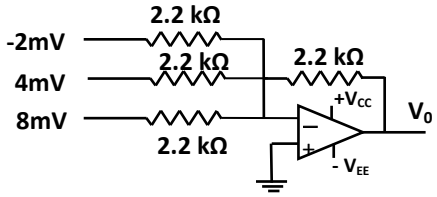
(Ans: + 6mV)

21. Calculate the output voltage for the circuit shown below.



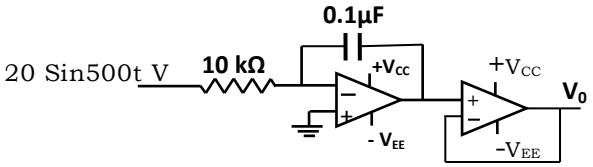
(Ans: -1.144V)

22. Calculate the output voltage for the circuit shown below.



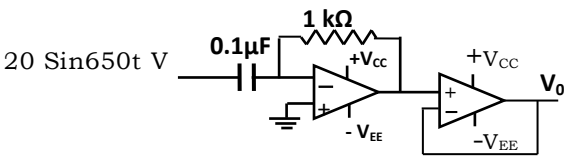
(Ans: -10mV)

23. Calculate the output voltage for the circuit shown below.



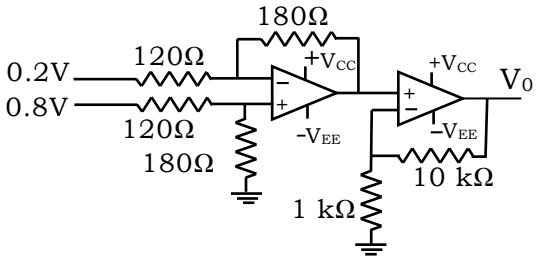
(Ans: 4cos500t V)

24. Calculate the output voltage for the circuit shown below.



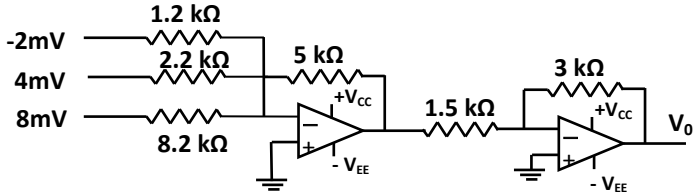
(Ans: -1.3Cos650t V)

25. Calculate the output voltage for the circuit shown below.



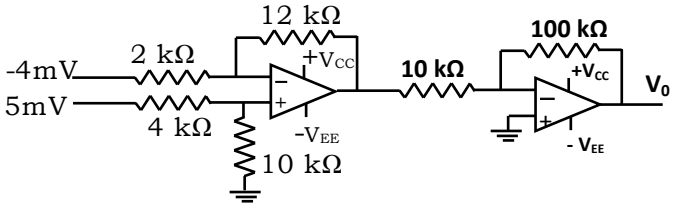
(Ans: 5.4V)

26. Calculate the output voltage for the circuit shown below.



Ans: 11.27mV)

27. Calculate the output voltage for the circuit shown below.



(Ans: -0.49V)

28. Calculate the cut-off frequency of a first-order low-pass filter for R = 1.2kΩ and C = 0.047µF.
(Ans: 2823.33 Hz)

29. Calculate the resistance of resistor of a first-order low-pass filter for f = 1.5kΩ and C = 0.022µF.
(Ans: 4825.32 Ω)

30. Calculate the capacitance of capacitor of a first-order low-pass filter for f = 1.59kΩ and R = 10kΩ.
(Ans: 10.01nF)

31. Calculate the cut-off frequency of a first-order high-pass filter for R = 1.2kΩ and C = 0.01µF.
(Ans: 13.26 kHz)

32. Calculate the resistance of resistor of a first-order high-pass filter for f = 10kΩ and C = 0.022µF.
(Ans: 723.79 Ω)

33. Calculate the capacitance of capacitor of a first-order high-pass filter for f = 15.9kΩ and R = 10kΩ.
(Ans: 1nF)

Chapter 6
Oscillators

One mark questions (knowledge)

1. What is a positive feedback?
2. What is an oscillator?
3. What is the function of an electronic oscillator?
4. What type of feedback is employed in oscillator?
5. What are sinusoidal oscillators?
6. What are non-sinusoidal or relaxation oscillators?
7. What are damped oscillations?
8. What are undamped oscillations?
9. What type of feedback is used in sinusoidal oscillator?
10. What is a tank circuit or tuned circuit?
11. What is low frequency oscillator?
12. Name any one low frequency oscillator.
13. What is high frequency oscillator?
14. Name any one high frequency oscillator.
15. Name any one type of RC oscillator.
16. Name any one type of LC oscillator.
17. Name the oscillator circuit that produces no phase shift in the feedback network.
18. Write the expression for frequency of oscillations of a Wien bridge oscillator.
19. Write the expression for frequency of oscillations of a RC phase shift oscillator.
20. Write the expression for frequency of oscillations of a Colpitts oscillator.
21. Write the expression for frequency of oscillations of a Hartley oscillator.
22. Name any one material which exhibits piezo electric effect.

One mark questions (Understanding)

1. Which signal acts as the starting signal for oscillations?
2. Write the expression for voltage gain of a positive feedback.
3. Mention one example for relaxation oscillator.
4. Mention one example for sinusoidal oscillator.
5. What should be the value of loop gain to start oscillations?
6. What should be the value of loop gain for sustained oscillations?
7. Classify the oscillators based on the frequency.
8. What type of feedback is used in Colpitts oscillator?
9. What type of feedback is used in Hartley oscillator?
10. How many RC sections are required for a phase shift oscillator?
11. What is the phase shift in each RC section of a phase shift oscillator?
12. Why is negative feedback provided in Wien bridge oscillator?
13. Mention the phase shift produced by the bridge network in a Wien bridge oscillator.
14. Mention the principle used in a crystal oscillator.
15. When do you prefer crystal oscillator?
16. Mention any one application of crystal oscillator.
17. Mention any one application of 555 timer.

One mark questions (skill)

1. Draw the basic block diagram of an oscillator.
2. Draw the tank circuit consisting of one capacitor and one inductor.
3. Draw the tuned circuit used in Hartley oscillator.
4. Draw the tuned circuit used in Colpitts oscillator.
5. Draw the tuned circuit used in RC phase shift oscillator.
6. Draw the tuned circuit used in Wien bridge oscillator.
7. Draw the circuit symbol of a crystal.
8. Draw the electrical equivalent circuit of crystal.

Two mark questions (knowledge)

1. What is an oscillator? How is it different from an amplifier?
2. Explain briefly the conditions of Barkhausen criterion.
3. What is a Hartley oscillator? Explain.
4. Write any two applications of a Hartley oscillator.
5. What is Colpitts oscillator? Explain.
6. Write any two applications of a Colpitts oscillator.
7. What is RC phase shift oscillator? Explain.
8. Write any two applications of a RC phase shift oscillator.
9. What is Wien bridge oscillator? Explain.
10. Write any two applications of Wien bridge oscillator.
11. What is crystal oscillator? Explain.
12. Write any two applications of crystal oscillator.
13. Explain piezoelectric effect.

Two mark questions (Understanding)

1. Distinguish between sinusoidal and relaxation oscillators.
2. Distinguish between damped and undamped oscillations.
3. Why do you use three RC sections in an RC phase shift oscillator?
4. Explain the tank circuit employed in Hartley oscillator.
5. Explain the tank circuit employed in Colpitts oscillator.
6. Mention any two advantages of a crystal oscillator over LC and RC oscillators.
7. Mention any two limitations of LC and RC oscillators.
8. Write any two advantages of RC oscillators over LC oscillators.
9. Why is quartz crystal commonly used in crystal oscillator?
10. Mention any two applications of a crystal oscillator.
11. Mention any two applications of a 555 timer.
12. Name the materials that exhibit piezoelectric effect and mention their application areas.

Two mark questions (Skill)

1. Draw the circuit diagram of a Hartley oscillator.
2. Draw the circuit diagram of a Colpitts oscillator.
3. Draw the circuit diagram of a RC phase shift oscillator.

4. Draw the circuit diagram of a Wien bridge oscillator.
5. Draw the circuit diagram of a crystal oscillator.
6. Draw the circuit symbol and equivalent circuit of crystal.
7. Draw the pin diagram of 555 timer IC.

Three mark questions (knowledge)

1. Explain briefly how the oscillations are produced in a LC tank circuit.
2. Explain the working of 555 timer IC in brief.

Three mark questions (Understanding)

1. Draw the circuit diagram of a Hartley oscillator. Mention the expression for its frequency of oscillations.
2. Draw the circuit diagram of a Colpitts oscillator. Mention the expression for its frequency of oscillations.
3. Draw the circuit diagram of a RC phase shift oscillator. Write the expression for its frequency of oscillations.
4. Draw the circuit diagram of a Wien bridge oscillator. Write the expression for its frequency of oscillations.

Three mark questions (skill)

1. Draw the circuit diagram of crystal oscillator. Draw the electrical equivalent circuit of a crystal.
2. Draw the functional block diagram of 555 timer.

Five marks questions (understanding)

1. With a circuit diagram explain the working of a Hartley oscillator. Write the expression for its frequency and feedback factor.
2. Draw the circuit diagram of Colpitts oscillator and explain its action. Write the expression for its frequency and feedback factor.
3. Explain the action of an op-amp RC phase shift oscillator with a circuit diagram. Write the expression for its frequency and feedback factor.
4. Draw the circuit diagram of an op-amp Wien bridge oscillator and explain its working. Write the expression for its frequency and feedback factor.
5. Explain the working of crystal oscillator with a circuit diagram. Write the expression for its frequency of oscillation.

PROBLEMS

1. A transistor Colpitts oscillator has L = 4 mH,C_1 = 10 nF andC_2 =10 nF. Determine the frequency of oscillations.

   (Ans: 35.6 kHz)
2. A Colpitts oscillator circuit is to generate a frequency of 24 kHz. The capacitors used are C_1 = 0.2µF and C_2 = 0.22 µF. Find the value of an inductor use.

   (Ans: 0.42 mH)
3. A Colpitts oscillator oscillates at 1.13 MHz. If the inductor in the feedback network has a value of 20 µH and one of the capacitors value is 0.1 µF. Calculate the value of the other capacitor.

   (Ans: 0.001 µF)

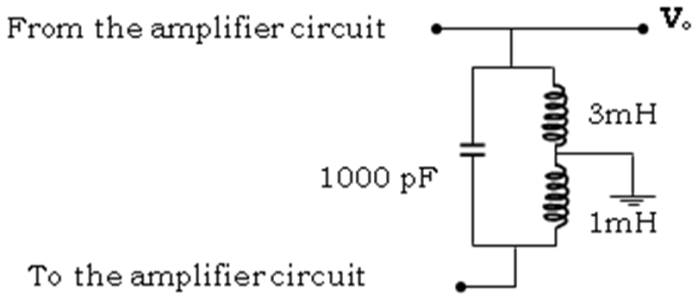
4. Calculate the frequency of oscillations and feedback ratio in a Colpitts oscillator circuit containing the tank circuit with L= 10µH, C_1= 0.22µF and C_2= 0.47µF. (Ans: 0.13 MHz, 0.46)

5. A Hartley oscillator has L_1 =3 mH, L_2 =5 mH and C =10 nF. Determine the frequency of oscillations.
(Ans: 17.8kHz)

6. A Hartley oscillator circuit is to generate a frequency of 1200 kHz. If the capacitor in the feedback network has a value of 220 pF and one of the inductors value is 20 µH, calculate the value of the other inductor.
(Ans: 60.03µH)

7. A Hartley oscillator oscillates at 54 kHz. The inductance of inductors used are L_1 = 30 mH and L_2=60 mH. Find the value of capacitance of the capacitor.
(Ans: 96.61 pF)

8. Calculate the frequency and feedback ratio of the circuit shown below.



(Ans: 56.3 KHz, 0.176)

9. A RC phase shift oscillator uses three identical RC sections in the feedback network. The values of the components are R = 680 Ω and C = 220 nF. Determine the frequency of oscillation.
(Ans: 434.5Hz)

10. What should be the value of capacitor required for a phase shift oscillator to produce a frequency of 338 Hz, if the resistance used is 220 Ω?
(Ans: 0.874 µF)

11. The frequency of the phase shift oscillator is 125 Hz. If the value of capacitance of the capacitor used is 0.22 µF, calculate the value of resistance used.
(Ans: 2363.9 Ω)

12. The frequency of the Wien bridge oscillator is 1200 Hz. If the resistance value used is 820 Ω, calculate the value of capacitance to be used.
(Ans: 0.161 µF)

13. The RC network of Wien bridge oscillator consists of resistors and capacitors of values R_1=R_2=R=270kΩ and C_1=C_2=C=470pF. Determine the frequency of oscillations.
(Ans: 1254.8 Hz)

14. The frequency of the Wien bridge oscillator is 1500 Hz. If the capacitance value used is C_1=C_2=C= 0.1 µF, calculate the value of resistance R_1=R_2=R to be used. (Ans: 1061.5Ω)

Chapter 7
Wireless Communications

One mark questions (knowledge)

1. What is wireless communication?
2. What is noise?
3. What is troposphere?
4. What are ground waves?
5. What are sky waves?
6. What are space waves?
7. What is the function of transmitter in a communication system?
8. What is the function of receiver in a communication system?
9. What is optical horizon?
10. What is radio horizon?
11. What is ionosphere?
12. Define skip distance.
13. Define skip zone.
14. Define critical angle.
15. Define critical frequency.
16. Define single hop distance.
17. What is multiple hop transmission?
18. What is fading?

One mark questions (understanding)

1. Define signal to noise ratio.
2. Define noise figure.
3. Mention the frequency of radio waves.
4. Name the mode of propagation of radio waves which travel in a straight line from the transmitting antenna to the receiving antenna.
5. Which layers of ionosphere disappear during night?

Two mark questions (knowledge)

1. Name the different layers of ionosphere.
2. Define signal to noise ratio. What is the significance of signal to noise ratio?

Two mark questions (understanding)

1. Mention the four types of radio wave propagation.
2. Which layers of ionosphere disappear during night? What is signal fading?
3. Distinguish between skip distance and skip zone.
4. Distinguish between sky waves and ground waves.
5. Distinguish between sky wave and space wave propagation.

6. Distinguish between single hop and multi hop transmissions.

Two mark questions (skill)

1. Draw the block diagram of a basic electronic communication system.

Three marks questions (knowledge)

1. Name the different modes of propagation of electromagnetic waves.

THREE marks questions (understanding)

1. Describe briefly the layers of the ionosphere and their effect on sky wave propagation.
2. Explain the importance of ionosphere in the radio communication.

Three marks questions (skill)

1. Draw a schematic diagram showing the (a) Ground wave (b) Sky wave (c) Space wave propagation modes for electromagnetic waves.

Chapter 8
Modulation and Demodulation

One Mark questions (knowledge)

1. What is modulating signal?
2. What is a carrier signal?
3. What is modulation?
4. Define amplitude modulation.
5. Define modulation index of an AM wave.
6. Define percent of modulation for an AM wave.
7. What is over modulation in AM?
8. Write the expression for total power of an AM wave.
9. Write the current relation for AM wave.
10. Define transmission efficiency of an AM wave.
11. Write the expression of transmission efficiency for AM signal in terms of modulation index.
12. Write an expression for the total modulation index of an AM wave when a carrier wave is modulated by several sine waves.
13. Expand DSB-SC.
14. Expand SSB-TC.
15. Expand SSB-SC.
16. Define frequency Modulation.
17. What is resting frequency?
18. Write an expression for instantaneous voltage of frequency modulated wave.
19. Define Modulation index of FM.
20. Write the expression for the modulation index of FM.
21. Define percent of modulation for FM wave.
22. Define frequency deviation in FM.
23. Define deviation ratio in FM.
24. What are guard bands in FM?
25. What are significant sidebands in FM?
26. Define Carrier Swing in FM.
27. What is the maximum permitted frequency deviation in FM broadcast band?
28. What is Pre-emphasis?
29. What is De-emphasis?
30. Define demodulation.
31. What is an envelope detector?
32. Define sensitivity.
33. Define selectivity.
34. Define fidelity.
35. What is intermediate frequency?
36. What is the function of a mixer in a radio receiver?
37. What is the function of a local oscillator in a radio receiver?
38. Name the most common device used for AM detection.
39. Expand AGC.
40. What is the main purpose of AGC?

41.What are transmission lines?
42.What is an antenna?
43.Name the antenna used in RADAR application.
44.Write any one application of horn antenna.
45.Write any one application of micro strip antenna.
46.What is digital communication?

One Mark questions (understanding)

1. How is the length of antenna related to frequency of the signal?
2. Write an expression for the instantaneous voltage of an AM wave.
3. Write an expression for modulation index of AM in terms of V_m and V_C.
4. How many sidebands are present in an AM wave?
5. Which components of the AM wave carry information?
6. Write an expression for amplitude of sidebands present in AM wave.
7. Write an expression for the bandwidth of an AM wave.
8. Write an expression for modulation index of an AM wave in terms V_{max} and V_{min}.
9. What happens when the modulation factor in an AM exceeds unity?
10. Why is the transmission of sidebands important in AM?
11. Expand DSB-SC.
12. Expand SSB-TC.
13. Expand SSB-SC.
14. Why are guard bands used in FM?
15. How many sidebands are present in FM wave?
16. In which type of modulation Pre-emphasis and De-emphasis networks are essential?
17. Name the circuit which separates the modulating signal and the carrier signal in a radio receiver.
18. Mention the function of limiter in FM.
19. Mention the value of IF for AM.
20. Mention the value of IF for FM.
21. Which type of antenna is used in small electronic devices?
22. Which frequency signals are processed by micro strip antenna?

One mark questions (skill)

1. Sketch the AM wave for $m_a<1$.
2. Sketch the AM wave for $m_a >1$.
3. Sketch the AM wave for $m_a =1$.
4. Mention any one application of transmission line.
5. Write any one application of helical antenna.
6. Write any one application of Yagi antenna.
7. Write any one application of loop antenna.

Two Mark questions (knowledge)

1. Mention the different types of modulation?

2. What is amplitude modulation? What is the value of m_a?
3. What is the range of modulation index in AM? Write the frequency expression for sidebands.
4. Define Modulation index of an AM wave. What is its significance?
5. Define transmission efficiency of AM and write its relation with m_a.
6. What are the advantages of SSB system over conventional DSB system?
7. What are the disadvantages of single side band transmission?
8. Define frequency modulation. Write an expression for instantaneous voltage of FM wave.
9. Draw the frequency spectrum of an FM wave.
10. What is carrier swing? Write an expression for carrier swing of an FM.
11. What is the purpose of a buffer amplifier stage in a transmitter?
12. What is Pre-emphasis? Where is it used?
13. What is De-emphasis? Where is it used?
14. What are the basic functions of radio receiver?
15. What are the characteristics of a good radio receiver?
16. Define the terms sensitivity and selectivity with respect to a radio receiver.
17. Define the terms stability and fidelity with respect to a radio receiver.
18. What are the advantages of super heterodyne receiver?
19. What is the need of IF amplifier in receivers?
20. What is the purpose of a discriminator in an FM broadcast receiver?
21. What are the advantages of FM over AM?
22. What are the disadvantages of FM system?
23. What are the applications of AM?
24. Name the primary constants of transmission lines?
25. Mention any two types of antenna.

Two Mark questions (understanding)

1. Why modulation is necessary?
2. What is over modulation and why is it not preferred in AM?
3. How many side bands are present in AM wave? Mention their amplitude.
4. Name the frequency components present in an AM wave? Which component carries information?
5. Explain briefly the principle of super heterodyne receiver.
6. How many sidebands are present in FM wave? Write the expression for Bandwidth.
7. Explain the need of AFC in FM transmitter.
8. Distinguish between Pre-emphasis and De-emphasis.
9. Why is demodulation required?
10. What do you mean by AGC? Why is it necessary for a receiver?
11. Describe the basic differences between AM and FM receivers.
12. Mention any two limitations of AM.
13. Distinguish between Loop antenna and Horn antenna.
14. Distinguish between analog communication and digital communication.

Two Mark questions (skill)

1. Draw the frequency spectrum of an AM wave and label it.
2. Draw the circuit of varactor diode modulator.

3. Draw the equivalent circuit of transmission line for low frequency.
4. Draw the equivalent circuit of transmission line for high frequency.
5. Write any two applications of Horn antenna.
6. Write any two applications of digital communication.

Three Mark questions (knowledge)

1. What is modulation? Briefly explain the need for modulation.

Three Mark questions (understanding)

1. Explain the frequency spectrum of an AM wave.
2. Explain the frequency spectrum of an FM wave.
3. Explain the following characteristics of a radio receiver.
   a. Sensitivity
   b. Selectivity
   c. Fidelity
4. Derive an expression for modulation index of an AM wave in terms of Vmax and Vmin.
5. Derive an expression for the total power of AM wave.
6. Briefly explain the function of an AM diode detector.
7. Describe basic operation of a varactor diode FM generator.
8. Distinguish between AM and FM.

Three Mark questions (skill)

1. Sketch the waveforms of AM wave for m_a=0.5, m_a=1and m_a=1.5
2. Draw the block diagram of AM transmitter.
3. Draw the circuit of an AM diode detector.
4. Draw the block diagram of SHD AM radio receiver.
5. Draw the block diagram of SHD FM radio receiver.
6. Draw the block diagram of digital communication.

Five Mark questions (knowledge)

1. With a block diagram explain the various stages of FM transmitter.

Five Mark questions (understanding)

1. Derive the voltage expression of an AM wave with relevant waveforms.
2. Derive an expression for the instantaneous value of a FM wave.

Five Mark questions (skill)

1. Draw the block diagram of AM transmitter and explain the various stages.
2. Draw the schematic diagram of a diode AM detector and describe its operation.
3. Draw the block diagram of super heterodyne AM radio receiver and explain the function of each block in brief.

4. Draw the block diagram of super heterodyne FM radio receiver and explain the function of each block in brief.

PROBLEMS:

1. Calculate the modulation index of AM wave if sinusoidal wave of peak value 4V is used to modulate the carrier of peak value of 5V.

   (Ans:0.8)
2. In AM the maximum and minimum amplitudes of a sinusoidal modulated wave are 4V and 1V. Determine the percentage modulation.

   (Ans: 60 %)
3. The amplitude of signal and carrier of an amplitude modulated wave are 4 V and 6 V respectively. Calculate V_{min} of the amplitude modulated wave.

   (Ans:2.04 V)
4. A sinusoidal carrier signal of peak amplitude 5V and frequency 100 kHz is amplitude modulated by a 5 kHz signal of peak amplitude 3 V. What is the modulation index? Draw the spectrum of the modulated signal.

   (Ans: 0.6,105 kHz, 95 kHz)
5. A modulating signal 10 $\sin(2\pi X10^3 t)$ is used to modulate a carrier signal 20 $\sin(2\pi X10^4)t$. Find the (a) modulation index (b) percentage modulation (c) frequencies of the sideband components and their amplitude (d) bandwidth of the amplitude modulated signal.

   (Ans:0.5,50 %, 9 kHz,11kHz,2 kHz)
6. A transmitter radiates 8 kW of power with carrier unmodulated and 10.125 kW when amplitude modulated. Calculate the percent of modulation.

   (Ans: 72.88%)
7. A radio transmitter is radiating a total power of 135 W when the modulation index is 0.7. What is the carrier power being radiated by the AM transmitter? (Ans:108.43 W)
8. An AM signal has a 15 W carrier and 1.5 W in each sideband. What is the percentage of modulation?

   (Ans: 63.24%)
9. Determine the power content of the carrier and each of the sidebands for an AM signal having a percent modulation of 80% and a total power of 2200 W.

   (Ans:1666 W.66 W,266.67 W)
10. Determine the percent modulation of an AM wave whose total power content is 2500 W and whose sidebands each contain 300 W. (Ans: 79.5 %)
11. The antenna current of AM transmitter is 15 A when un modulated but rises to 18 A when modulated. Calculate the depth of modulation.

    (Ans: 0.938)
12. An antenna has an impedance of 50 Ω. A un modulated AM signal produces a current of 4.8 A. The percentage of modulation is 90.Calculate (a) the carrier power (b) the total power and (c) sideband power.

    (Ans:1152 W, 1613 W, 461 W)
13. The antenna current of an AM transmitter is 8A when only the carrier signal is transmitted. It increases to 8.93A when the carrier signal is modulated by a sinusoidal signal. Find the modulation index and percentage of modulation. Determine the antenna current when modulation index is changed to 0.8.

    (Ans: 0.7,70%,9.2A)

14. What is the power developed in an amplitude modulated wave in a load of 100 Ω, when the peak voltage of the carrier is 100V and the modulation index is 0.5?

(Ans: 18.75 W)

15. A carrier signal having 10V peak amplitude is amplitude modulated by three different modulating signals with peak amplitude levels of 2V, 3V and 4V respectively. Compute the modulation index of resultant complex AM signal.

(Ans: 0.538)

16. An AM transmitter has un modulated carrier signal power 100W which is modulated by three modulating signals simultaneously with modulation indices as of m_{a1} = 0.2, m_{a2} = 0.4, m_{a3} = 0.5.Determine the modulation index of complex AM signal.

(Ans: 0.67)

17. An FM signal has a deviation of 10 kHz and a modulating frequency of 5 kHz, calculate the modulation index.

(Ans: 2)

18. Calculate the frequency deviation for an FM signal with a modulating frequency at 5kHz and a modulating index of 5.

(Ans:25 kHz)

19. Determine the modulation index of an FM carrier having a frequency deviation of 25 kHz and a modulating signal of 5 kHz. Also determine the carrier swing.

(Ans: 12.5,50 kHz.)

20. A 93.2 MHz carrier is frequency modulated by a 5 kHz sine wave. The resultant FM signal has a frequency deviation of 50kHz. Find the carrier swing of the FM wave. Determine the highest and lowest frequencies attained by the modulated signal. What is the modulation index of the FM wave?

(Ans:100 kHz,93.25 MHz,93.15 MHz,10)

21. Determine the percent modulation of an FM signal which being broadcast in the 88-108 MHz band, having a carrier swing of 110 kHz.

(Ans:73.33)

22. A FM wave is represented by $10 \sin[2\pi X10^{8}t + 5 \sin 2\pi X200t]$. Determine (a) the carrier and modulating frequency, (b) the modulation index and (c) maximum deviation.

(Ans: 100 MHz, 200Hz, 5.1 kHz)

23. A frequency modulated signal is given by $75 \sin[2\pi X5X10^{6}t + 6 \sin 200\pi t]$ Determine (a) the modulating signal frequency,(b) the carrier frequency,(c)peak deviation,(d) the deviation ratio, and (e) the modulation index.

(Ans: 100 Hz, 5 MHz,600 Hz, 750,6)

24. Determine the frequency of the modulating signal which is producing an FM signal having a bandwidth of 60 kHz when the frequency deviation of FM signal is 10 kHz.

(Ans: 20 kHz)

25. An FM radio has a frequency deviation of 30 kHz. The modulating frequency is 4 kHz. Calculate the bandwidth needed. What is the new bandwidth if the deviation is reduced to 15 kHz?

(Ans: 68kHz,38 kHz)

26. A super heterodyne receiver using an intermediate frequency of 455 kHz is receiving a modulated signal of 910 KHz. What is the frequency of local oscillator? What could be its image frequency?

(Ans: 1365 kHz, 1820 kHz)

Chapter 9
Power Electronics and its applications

One mark questions (knowledge)

1. What is power electronics?
2. What is a power diode?
3. Name any one power semiconductor device.
4. Draw the circuit symbol of a power diode.
5. Name the lightly doped layer in power diode.
6. What is the magnitude of impurity atom density in drift layer?
7. What is the magnitude of impurity atom density in heavily doped regions?
8. What is the significance of drift region in power diode?
9. What is meant by 'double injection' in a power diode?
10. What is power BJT?
11. Expand PBJT.
12. Name the three terminals of a SCR.
13. What is the other name for SCR?
14. Write an expression for SCR anode current when gate current is zero.
15. Write an expression for SCR anode current when positive gate current is applied.
16. What is holding current in SCR?
17. What is latching current in SCR?
18. Expand MOSFET.
19. Name the terminals of MOSFET.
20. Expand IGBT.

One mark questions (understanding)

1. Which layer is called as 'drift layer' in power diode?
2. Which are the two heavily doped layers in power diode?
3. How do you designate heavily doped n layer?
4. Write an expression for the voltage drop across forward conducting power diode.
5. In which region of the power diode the conductivity modulation takes place?
6. Which region of the power transistor is lightly doped?
7. How many PN junctions are there in SCR?
8. How many regions are there in SCR?
9. Mention one application of TRIAC.
10. In what respect a TRIAC is better than SCR?
11. Which power semiconductor device is categorized as bidirectional current controlled?
12. Power MOSFET is a voltage controlled device. Why?
13. Mention one application of MOSFET.
14. Which semiconductor device combines the features of both MOSFET and BJT?
15. What is an IGBT?
16. IGBT is a voltage controlled device. Why?
17. Mention one application of IGBT.

One mark questions (skill)

1. Draw the circuit symbol of npn PBJT.
2. Draw the circuit symbol of pnp PBJT.
3. Draw the circuit symbol for SCR.
4. Draw the circuit symbol for TRIAC.
5. Draw the circuit symbol for n-channel enhancement type MOSFET.
6. Draw the circuit symbol for p-channel enhancement type MOSFET.
7. Draw the circuit symbol for n channel IGBT.

Two marks questions (knowledge)

1. What are the main areas of application of power electronics?
2. What is meant by conductivity modulation?
3. What is meant by double injection?
4. What is the significance of material designated p^+ and n^- in a power diode?
5. What is meant by a punch through p-n power diode?
6. What is meant by a non-punch through p-n power diode?
7. What are the conditions under which a transistor operates as a switch?
8. What is a Silicon Controlled Rectifier? Why is it so called?
9. What is TRIAC? How is different from a SCR?
10. Name some applications of TRIAC.
11. What is TRIAC? Give the circuit symbol of TRIAC.
12. Mention the four operating modes of TRIAC.
13. What is MOSFET? Explain its principle of operation.
14. What is MOSFET? What are the types of MOSFETs?
15. What are the different types of power MOSFET?
16. Name the different operating regions of MOSFET.

Two marks questions (understanding)

1. In what way a power diode is different from signal diode?
2. Derive an expression for the voltage drop across a forward biased p-n junction power diode.
3. List the applications of SCR.
4. Mention any two features of SCR.
5. Is it possible to turn ON the SCR with the gate open circuited? Explain.
6. Distinguish between holding current and latching current of a SCR.
7. Distinguish between SCR and TRIAC.

Two marks questions (skill)

1. Draw the cross sectional view of a typical pn junction power diode. Indicate typical dimensions and doping levels.
2. Draw the I-V characteristics of forward biased power diode.
3. Draw the circuit diagram of a power BJT in CE configuration.

4. Draw the equivalent circuit of two transistor analogy of a SCR.
5. Draw the V-I characteristics of SCR.
6. Sketch the typical V-I characteristics of an SCR. Indicate all the regions of the characteristics.
7. Draw the I-V characteristics for TRIAC.
8. Sketch the output characteristics of MOSFET.
9. Draw the circuit diagram of MOSFET to plot its output characteristics.
10. Draw the circuit symbol of IGBT and name its terminals.
11. Draw the circuit diagram of n channel IGBT to plot its output characteristics.

Three marks questions (knowledge)

1. What is meant by a punch through pn power diode? Draw the diagram giving electric field profile of this diode.
2. What is meant by a non-punch through pn power diode? Draw the diagram giving electric field profile of this diode.
3. What are the regions of operation of a power BJT? In which regions the BJT operates while acting as a switch?
4. Explain the construction of SCR. Give its circuit symbol.
5. What is meant by triggering of SCR? Describe the method to trigger an SCR.
6. List the modes of operation of TRIAC and mention the preferred modes.

Three marks questions (understanding)

1. With a diagram explain constructional features of a power BJT.
2. With a diagram explain P+ n– junction under thermal equilibrium.
3. Distinguish between punch through and non-punch through power diodes?
4. Explain the construction of SCR. Give its circuit symbol.
5. Compare TRIAC with SCR.

Three marks questions (skill)

1. What are the regions of operation of a power BJT? In which regions the BJT operates while acting as a switch?
2. Sketch I-V characteristics of SCR for different gate currents and indicate there upon holding current, latching current and break over voltage.

Five mark questions (knowledge)

1. What is a power diode? In what way a power diode is different from signal diode? With a diagram explain constructional features of a power BJT.
2. What is SCR? Draw the equivalent circuit of two transistor analogy of a SCR. Define latching current and how it is different from holding current?

Five mark questions (understanding)

1. Explain with a circuit diagram working of power diode under forward bias. What is meant by conductivity modulation?
2. Draw the circuit diagram of a power BJT in CE configuration to draw output characteristics. Explain different operating regions of BJT.
3. What is SCR? Explain its construction. Distinguish between holding current and latching current of a SCR.
4. With a circuit diagram explain the two transistor model of SCR. Derive an equation for anode current for zero gate current.
5. Draw the circuit diagram of IGBT to draw output characteristics. Explain different operating regions of V-I characteristics.

Five mark questions (skill)

1. Draw the structure of a power diode showing impurity atom and densities. What is the significance of material designated p^+, n^- ? Draw the diagram giving electric field profile of punch through pn junction diode.
2. Draw the circuit diagram of IGBT to draw output characteristics. Sketch different operating regions of V-I characteristics. Mention one application of IGBT.

Problems:

1. A silicon diode has a saturation current of $0.1X10^{-12}$A at 20° C. Find its current when it is forward biased by 0.55V. (Ans: 0.283mA)
2. For silicon diode with reverse saturation current of 2.5μA at 300K, find the forward voltage at a forward current of 10mA. (Ans: 0.43V)
3. A p-n junction diode has a reverse saturation current rating of 100 nA at 50°C. What should be the value of the forward current for a forward voltage drop of 0.6 V? (Ans:223.72A)
4. Determine cathode current I_K of SCR when $I_G = 0$. Given $(\alpha_1 + \alpha_2) = 0.99$ and $(I_{CO1} + I_{CO2}) = 3$mA. (Ans: 0.3A)
5. Determine anode current I_A of SCR when gate current I_G=50mA, α_1= 0.495, α_2= 0.495 and I_{CO1} = 1 mA and I_{CO2} = 1 mA. (Ans: 2.675A)

APPLICATIONS OF POWER ELECTRONICS

One mark questions (knowledge)

1. What is meant by uncontrolled rectifier?
2. What is meant by phase controlled rectifier?
3. Give an expression for average voltage of single phase half wave rectifier.
4. Give an expression for average voltage of single phase full wave rectifier.
5. Name the device used in phase controlled rectifier.
6. Define the conduction angle for a SCR.
7. Define the firing angle for a SCR.
8. What does ac voltage controller mean?
9. Name the converter which converts AC to unipolar DC current.
10. What is a DC chopper?
11. Define duty cycle.
12. Mention an application of DC to AC converter.

13.What is an inverter related to power electronics?
14.Mention the use of pulse transformer isolator circuit.
15.What is opto-coupler?
16.What is pulse transformer?
17.Mention the use of Opto-coupler isolator circuit.
18.What is snubber circuit?
19.Mention how power devices can be protected from excessive temperature.

One mark questions (Understanding)

1. How can you control the output voltage of a rectifier?
2. Which power semiconducting device is used in the construction of single phase AC voltage controller?
3. Write an expression for the average voltage of a DC chopper.
4. Why the protection is required for SCR?
5. Why snubber circuits are used?

One mark questions (skill)

1. Draw the symbol of rectifier.
2. Draw the symbol of AC voltage controller.
3. Draw the symbol of DC chopper.
4. Draw the symbol of Inverter.

Two marks questions (knowledge)

1. Name the types of power converters and draw their symbol.
2. Define firing angle and conduction angle of SCR.
3. Mention some of the applications of phase controlled rectifiers.
4. What is a chopper? Name some applications.
5. What is an inverter? How does it differ from a converter?
6. Name any two types of isolator circuit.

Two marks questions (understanding)

1. Why the power semiconductor devices are used in power controls?
2. What is the difference between half-wave controlled rectifier and full-wave controlled rectifier?
3. In a DC chopper how can the output voltage be varied?

Two marks questions (skill)

1. Draw the circuit of pulse transformer isolator to drive SCR.
2. Draw the schematic diagram of IGBT based single phase inverter.
3. Draw the circuit of Opto-coupler isolator.

Three mark questions (Knowledge)

1. What is a chopper? Mention any two applications of choppers.
2. What is an inverter? Name any two types of isolator circuit.

Three mark questions (understanding)

1. With circuit diagram explain the working of Opto-coupler isolator circuit.
2. With circuit diagram explain the working of pulse transformer isolator circuit to drive SCR.

Three mark questions (skill)

1. Draw the circuit diagram of single phase SCR half wave rectifier with RC triggering. Sketch its input and output waveform.
2. Draw the circuit diagram of single phase SCR full wave rectifier with RC triggering. Sketch its input and output waveform.
3. Draw the circuit diagram of TRIAC AC voltage controller with RC triggering. Sketch its input and output waveform.
4. Draw the circuit diagram of DC to DC chopper. Sketch input and output waveform.
5. Draw the schematic diagram of IGBT based single phase inverter and output waveforms

Five mark questions (understanding)

1. With circuit diagram explain the working of single phase SCR half wave rectifier with RC triggering.
2. With circuit diagram explain the working of single phase SCR full wave rectifier with RC triggering.
3. With circuit diagram explain the working of TRIAC AC voltage controller with RC triggering.
4. With circuit diagram explain the working of DC to DC chopper. Sketch input and output waveform.

Five mark questions (skill)

1. Draw the circuit diagram of single phase SCR full wave rectifier with RC triggering. Sketch its input and output waveform. Draw the circuit of pulse transformer isolator to drive SCR.
4. Draw the schematic diagram of IGBT based single phase inverter and output waveforms. Draw the circuit of pulse transformer isolator to drive SCR.

Problems:

1. A thyristor is connected in series with a load resistance 50 Ω. The supply voltage is 230 V, 50 Hz. The thyristor is triggered at an angle of 30° during every positive half cycle. Compute the (a) average value of load voltage and (b) average value of load current.

   (Ans: 96.60 V,1.93A)
2. A transformer with secondary voltage of 230V, 50Hz, delivers power to 10 Ω load through a half wave controlled rectifier circuit. Determine (i) average output voltage (ii) average load current.

   (Ans: 77.64 V, 7.764 A)
3. A half wave rectifier feeds a 15 ohm resistance. The supply voltage is 230 V. The firing angle is □/2. Find (a) average value of load voltage and (b) average value of load current (c) power delivered to the load.

   (Ans: 51.76 V, 3.45 A, 178.57W)
4. A single phase half wave rectifier circuit using a thyristor is fed by a transformer whose secondary voltage is 400 sinωt. Find the average load voltage and average load current if the thyristor is fired at 30° in each positive half cycle.

   (Ans: 118.8 V,2.376 A)

5. A single phase full controlled converter is supplied from a 230V, 50Hz ac supply for a firing angle of 30°, determine the average load voltage consider load as purely resistive.

(Ans: 193.20V)

6. A single phase full wave rectifier has an input voltage of 200 V rms. The load resistance is 100 Ω and firing angle is 30°.Find average load voltage and average load current.

(Ans: 167.98 V,1.68 A)

7. A full wave controlled rectifier rectifies 230 V, 50Hz a.c mains and give an output of 150V to a resistive load of 10 Ω. Find the firing angle.

(Ans: 63.33°)

8. A basic chopper is supplied from a 220V dc source. The load is pure resistance. If the duration of the ON and OFF time are 0.3 ms and 0.5 ms respectively, determine average load voltage.

(Ans: 82.5 V)

9. For a basic feeding a resistive load, the average load voltage is 132V and the input voltage is 220V. If the time for which the semiconductor ON is 0.24 ms, find the OFF period.

(Ans: 0.16ms)

Chapter 10
Digital Electronics

One mark questions (Knowledge)

1. What is a logic gate?
2. Mention any one basic logic gate.
3. Name any one combinational logic gate.
4. What is an XOR gate?
5. Write the output Boolean expression for the two input XOR gate.
6. Write the truth table of two inputs XOR gate.
7. Write the Boolean expression for the output of XNOR gate.
8. Define an XNOR gate.
9. Write the truth table of XNOR gate.
10. What is a NAND gate?
11. What is a NOR gate?
12. Name the two input logic gate whose output is “HIGH” only when it’s both the inputs are HIGH, otherwise the output will stay LOW.
13. Name the two input logic gate whose output is “HIGH” only when its two inputs are different.
14. Name the two input logic gate whose output is “HIGH” only when its two inputs are identical.
15. Define universal gate.
16. What is the speciality of NAND and NOR gate?
17. What are digital codes?
18. What is meant by BCD code?
19. What is a gray code?
20. What are weighted codes?
21. What are non-weighted codes?
22. Name any one non-weighted code?
23. What is a self-complementing code?
24. What are canonical forms of Boolean expressions?
25. What is a canonical SOP expression?
26. What is a canonical POS expression?
27. What is Karnaugh map?
28. What is meant by looping related to K-map?
29. What is meant by overlapping group in K-map?
30. What is redundant group in K-map?
31. What are don’t care conditions?
32. Define a Pair in K-map.
33. Define a Quad in K-map.
34. Define an Octet in K-map.
35. Define combinational logic circuit.
36. What is a sequential logic circuit?
37. What is a latch?
38. What is a flip flop?
39. Define a clock pulse.

40. What is a register?
41. Expand SISO related to shift register.
42. Expand SIPO related to shift register.
43. Expand PISO related to shift register.
44. Expand PIPO related to shift register.
45. What is a binary counter?
46. What does the term “asynchronous” mean in relation to binary counter?
47. What is an alphanumeric code?
48. What is the binary equivalent of the gray code 1011?
49. What is the gray code equivalent of the binary number 1011?
50. Expand ASCII.
51. Expand EBCDIC.
52. What is a half adder?
53. What is a full adder?
54. What is a half subtractor?
55. Write the Boolean expression for the sum of half adder.
56. Write the Boolean expression for the sum of full adder.
57. Write the Boolean expression for the carry of half adder.
58. Write the Boolean expression for the carry of full adder.
59. Write the Boolean expression for the difference of half subtractor.
60. Write the Boolean expression for the carry of the half subtractor.
61. Define minterm.
62. Define maxterm.
63. What is a SOP expression?
64. What is a POS expression?
65. What do you understand by the term “canonical form”?

One mark questions (understanding)

1. If A and B are the inputs of XOR-gate, write its output Boolean expression.
2. Why NAND and NOR gates are called universal gates?
3. How many two input NAND gates must be used to produce two input OR function?
4. How many two input NOR gates must be used to realize two input OR function?
5. Why do we use digital codes?
6. Give an example for weighted codes?
7. Give an example for a self-complimenting code.
8. Give an example for alphanumeric code.
9. Which digital code is also called as uni-distance code?
10. Why the gray code is also called as uni-distance code?
11. Expand SOP.
12. Expand POS.
13. How many cells an n variable K-map can have?
14. How many variables are eliminated from a pair?
15. How many variables are eliminated by a quad?
16. How many variables are eliminated by an octet?

17. How is D flip flop constructed from RS flip flop?
18. How is T flip flop constructed from JK flip flop?
19. Which is the line used to transfer data in and out of a PISO shift register?

One mark questions (skill)

1. Draw the symbol of XOR gate.
2. Draw the symbol of XNOR gate.
3. Realize OR gate using NAND gate.
4. Realize AND gate using NOR gate.
5. Convert 1001(Gray) to binary.
6. Convert 1001(2) to gray code.
7. Convert the decimal number 29 to BCD.
8. Write the decimal number 101 in BCD.
9. Write the BCD equivalent of the decimal number 123.
10. Draw the block diagram of half adder.
11. Draw the block diagram of full adder.
12. Draw the block diagram of half subtractor.

Two mark questions (Knowledge)

1. Realize XOR gate using basic gates.
2. What is an XOR gate? Write its truth table.
3. What is an XNOR gate? Write its truth table.
4. Realize XNOR gate using basic gates.
5. What are universal gates? Why they called so?
6. Realize XNOR gate using only NOR gates.
7. Realize XOR gate using NAND gates.
8. Name the universal logic gates.
9. What is an excess-3 code?
10. What do you understand by self-complementing code? Give examples.
11. Realize a half adder using XOR and AND gates.
12. Realize a half adder using only NAND gates.
13. Write the Boolean expression for the sum and carry of a full-adder.
14. Realize a half subtractor using XOR, NOT and AND gates.
15. Realize a half subtractor using NAND gates.
16. Write the Boolean expression for the difference and barrow of a half-subtractor.
17. Define Product term and Sum term.
18. What do you understand by ‘don’t care’ condition? How it is useful in K-map simplification?
19. What is a Pair? How many variables can be eliminated by a Pair in the K- map?
20. What is a Quad? How many variables can be eliminated by a quad in the K-map?
21. What is an octet? How many variables can be eliminated by an octet in the K-map?
22. What do you mean by alphanumeric codes? For what they are used?
23. What is race around condition? How can it be overcome?
24. Draw the logic circuit of a basic NAND latch.

25. Draw the logic circuit of un-clocked SR flip flop using NAND gates.
26. Draw the logic circuit of a D flip flop using NAND gates.
27. Draw the logic circuit of a JK flip flop using NAND gates.
28. Draw the logic circuit of JK master-slave flip-flop.
29. Mention the applications of flip-flops.
30. Mention the four types of registers.
31. Mention the applications of registers.
32. Draw the logic diagram of a 4-bit SISO shift register.
33. Draw the logic diagram of a 4-bit SIPO shift register.
34. Draw the logic diagram of a 4-bit PIPO shift register.
35. List the types of registers.
36. Write down the various modes of operation of shift register.

Two mark questions (Understanding)

1. Distinguish between excess-3 and BCD codes.
2. What do you understand by self-complementing code? Give examples.
3. Distinguish between weighted codes and non-weighted codes.
4. Write the difference between sum of product (SOP) and product of sum (POS).
5. Briefly explain the property rolling of K-map?
6. Explain the necessity of eliminating redundant groups in a K-map.
7. Distinguish between combinational and sequential logic circuits.
8. Compare asynchronous and synchronous counters.

Two mark questions (Skill)

1. Draw the pin diagram of IC 7400.
2. Draw the pin diagram of IC 7402.
3. Show how a two input OR-gate can be constructed from only NAND-gates.
4. Convert the gray code 1001 into binary using XOR gates.
5. Convert $456_{(10)}$ to BCD code.
6. Convert decimal 786 into 8421 code.
7. Write the applications of gray code?
8. Draw the block diagram of a full adder using two half adders and one OR gate.
9. Draw the truth table of a full adder.
10. Convert AB + $\bar{B}$ into canonical SOP expression.
11. Convert (A+B) (B+$\bar{A}$) into canonical POS form expression.
12. Write the decimal number 25 in BCD and exces-3 code.

Three mark questions (Knowledge)

1. Realize AND, OR and NOT gates using NOR gate only.
2. Realize AND, OR and NOT gates using NAND gate only.
3. What is half-adder? Draw the logic diagram and truth table of half adder.
4. What is half-subtractor? Draw the logic diagram and truth table of half subtractor.

5. What are self-complementing codes? Explain with a numerical example.
6. Mention the steps to be followed to convert SOP form of expression into canonical SOP expression.
7. Mention the steps to be followed to convert POS form of expression into canonical POS expression.
8. What is meant by don't care condition in K-map method? Explain it in brief.
9. What is a clock? State its use.
10. Mention a few applications of flip flops.

Three mark questions (Understanding)

1. Compare sequential and combinational logic circuits.
2. Distinguish between latch and flip-flop.
3. Explain the race-around condition in a JK flip-flop and how can it be eliminated?
4. With a logic circuit and truth table explain the working of D-flip-flop.
5. With a logic circuit and truth table explain the working of T-flip-flop.

Three mark questions (Skill)

1. Draw the logic circuits for the realization of basic logic operations using NAND gate only.
2. Convert the Boolean expression A.B + B.C + A.C into its canonical SOP form expression.
3. Convert the Boolean expression (A+B).(B+C).(A+C) into its canonical POS form expression.
4. Convert the logical function of three variables F(A,B,C)= A+B.C to standard SOP expression.
5. Convert $(1001)_2$ into equivalent gray code using XOR-gates.
6. Convert $(1001)_{Gray}$ into equivalent binary using XOR-gates.
7. Find the excess-3 code of $(786)_{10}$.
8. Convert the decimal number 789 into excess-3 code.
9. Write the excess-3 equivalent the decimal number 102.
10. Draw the logic circuit of a four bit PISO shift register.

Five mark questions (Knowledge)

1. What is a NAND gate? Realize AND, OR, NOT and XNOR gates using NOR gates
2. What is a NOR gate? Realize AND, OR, NOT and XOR gates using NAND gates.
3. What is a full-adder? Draw the diagram of full-adder using two half adders and an OR-gate. Write the truth table of full-adder.
4. Write steps involved in the simplification of Boolean equation using K-map technique.

Five mark questions (Understanding)

1. With a logic circuit and truth table explain the working of clocked SR flip-flop.
2. With a logic circuit and truth table explain the working of JK flip-flop.
3. With a relevant diagram explain the working of serial-in-serial-out (SISO) shift register.
4. With a relevant diagram explain the working of 4-bit synchronous up counter.
5. Give a comparison table of synchronous and asynchronous counters.

Problems

1. Simplify the Boolean expression Y= ∑m (0, 2, 4, 8, 10) +∑d (12, 14) using K-map. Draw the NAND gate equivalent circuit to realize the simplified expression.
2. Simplify the Boolean expression Y= ∑m (4, 5, 7, 9, 11, 12, 13, 15) +∑d (1, 3, 8) using K-map. Draw the NAND gate equivalent circuit to realize the simplified expression.
3. Simplify the Boolean expression Y= ∑m (0, 2, 6, 8, 10, 12, 14) +∑d (4, 9, 13) using K-map. Draw the NAND gate equivalent circuit to realize the simplified expression.
4. Simplify the Boolean expression Y= ∑m (1, 3, 5, 6, 8, 9, 11, 12) +∑d (0, 7, 14) using K-map.
5. Simplify the Boolean expression Y= ∑m(0,2,4,6,8,10,11,12,14,15) +∑d(9,13) using K-map.
6. Simplify using K-map, Y(A,B,C,D)=∑m(0,1,4,13,15) + ∑d(2,5,7).
7. Simplify the Boolean expression Y(A,B,C,D)=∑m(1,2,3,5,6,7,12)) using K-map. Also draw the logic circuit for the simplified expression using basic gates.

Chapter 11
Microcontroller

One Mark questions (Knowledge)

1. What is microcontroller?
2. What is microprocessor?
3. Mention the size of RAM in 8051.
4. Mention the size of the on chip ROM in 8051.
5. What is the width of data bus in 8051?
6. What is Accumulator?
7. What is 'B' register?
8. What is data pointer (DTPR)?
9. What is stack pointer?
10. What is the function of the Program Counter?
11. Name any one 16 bit register of 8051.
12. What is the function of the Stack Pointer?
13. Expand PSEN in 8051 microcontroller.
14. Expand SFR.
15. Expand PSW.
16. What is an interrupt?
17. What is Addressing mode in 8051?
18. Expand EEPROM.
19. Expand SRAM.
20. Expand RAM.
21. What is machine language?
22. Mention one example for data transfer instructions.
23. Mention one example for arithmetic instructions.
24. Mention one example for logical instructions.
25. Mention one example for branch instructions.
26. What is the use of MOV X instruction?
27. What is assembler?
28. What is debugger?
29. What is the purpose of NOP instruction?
30. What is PIC microcontroller?
31. Expand PIC.

One Mark questions (understanding)

1. Why 8051 is called 8 bit microcontroller?
2. How many serial ports are there in 8051?
3. How many timers are there in 8051?
4. How many interrupt sources are there in 8051?
5. Which register holds the address of the next instruction to be executed?
6. How many bits of binary data can a register A hold?
7. How many bits of binary data can a register R hold temporarily?

8. How many bits of address can register PC hold?
9. How much of total external data memory can be interfaced to the 8051?
10. How many I/O ports are there in 8051?
11. How many interrupts are there in 8051?
12. Which is the only register without internal on-chip RAM address in 8051?
13. Which memory is referred as data memory?
14. Which memory is referred as code memory or program memory?
15. Why oscillator circuit is used?
16. Which addressing mode can be used with PUSH and POP instructions?
17. Which is the addressing mode for the instruction MOV A, #50H?
18. Which is the addressing mode for the instruction MOV A, 50H?
19. Which is the addressing mode for the instruction MOV A, @R0?
20. What does the following instruction do? "MOV A, 0F0H"
21. What does the following instruction do? "MOV A, 1FH".
22. Which is the addressing mode for the instruction MOVC A, @A+DPTR?
23. Which symbol is used in the instruction while using register indirect addressing mode?
24. Which symbol is used in the instruction while using immediate addressing mode?
25. Why ROM is non-volatile?
26. Why RAM is volatile?
27. Why is the instruction MOV R1,, R0 invalid?
28. Which conditional jump instruction checks the contents of accumulator for zero?
29. Which operation is performed by stack pointer during its incremental phase?
30. Which operation is performed by stack pointer during its decremental phase?

One Mark questions (skill)

1. Register R0 contains 50H and Accumulator contains 01H. What will be the content of A after executing the instruction MOV A, R0?

Two Mark questions (knowledge)

1. Mention the features of 8051 microcontroller?
2. What is an addressing mode? Why is it necessary?
3. Write any two examples for direct addressing instructions?
4. What is register addressing mode? Mention one example.
5. What is direct addressing mode? Mention one example.
6. What is indirect addressing mode? Mention one example
7. What is immediate addressing mode? Mention one example.
8. What are the fields of an assembly language instruction?
9. What are data transfer instructions? Give one example.
10. What are arithmetic instructions? Give one example.
11. What are logical instructions? Give one example.
12. What are branch instructions? Give one example.
13. Write the instructions to load value FFH internal RAM address 50H using direct and indirect addressing modes.
14. What is the difference between MOVC and MOVX instructions of 8051?

15. What are single bit instructions? Give example.
16. Mention two assembler directives?
17. What are the instructions used to access external RAM?
18. What is meant by mnemonic ACALL and LCALL?
19. What is the advantage of short jump over long jump instruction?
20. Define the terms op-code and operand.
21. Mention the main features of PIC microcontroller.

Two Mark questions (understanding)

1. Mention two differences between microprocessor and microcontroller.
2. Differentiate between program memory and data memory.
3. Which general purpose registers are used for multiplication and division operations in 8051?
4. Differentiate between LCALL and ACALL instructions of 8051.
5. Distinguish between PIC and Microcontroller.

Two Mark questions (skill)

1. What will be the contents of A after execution of following instructions.
   i. MOV A , #54H
   ii. CPL,A
2. Draw the internal RAM memory organization of 8051.

Three Mark questions (knowledge)

1. List the features of 8051 microcontroller.
2. List the applications of microcontroller.
3. What is the function of stack pointer? How stack works?
4. What is meant by Addressing mode in 8051? Name any two addressing modes.
5. Mention the addressing modes of 8051 microcontroller.
6. What are the fields of assembly language instruction? Explain with one example.
7. Write the instructions to add numbers 10H and 20H and store the result in to internal RAM address 30H.
8. What is meant by unconditional jump? List the unconditional jump instructions of 8051.
9. What is meant by conditional jump? List the conditional jump instructions of 8051.

Three Mark questions (understanding)

1. Explain the functions of PUSH and POP with example.
2. Explain immediate addressing mode with example.
3. Explain direct addressing mode with example.
4. Explain register addressing mode with example.
5. Explain register indirect addressing mode with examples.
6. Classify the instruction set of 8051 with respect to their functions.
7. How many bytes are required by SJMP, AJMP and LJMP instructions?

Five Mark questions (knowledge)

1. What is meant by addressing mode? How many addressing modes are there in 8051? Mention one example for each.

Five Mark questions (understanding)

1. Compare microprocessor with microcontroller.
2. With a flow chart explain the steps used in creating assembly language program in 8051.

Five Mark questions (skill)

1. Draw the general block diagram of microcontroller.
2. Draw the block diagram of microcontroller 8051.
3. Draw the pin diagram of 8051 IC.

Programs:

1. Write a program to add two numbers 07H and 82H and store the result at memory location 40H.
2. Write a program to multiply two 8 bit numbers 06H and 09H at memory locations 40H and 41H respectively. Store the result at memory locations 42H (Lower Byte) and 43H (Higher Byte)
3. Write a program to divide two 8 bit numbers stored at memory locations 40H and 41H respectively. Store the quotient at memory locations 42H and remainder at memory location 43H
4. Write a program to add the values of locations 40H and 41H and store the result in locations 50H and 51H.
5. Write the instructions to move value 34H into register A and value 3FH into register B, then add them together.
6. Write the instructions to add the values 16H and CDH, place the result in register R_2.
7. Write a program to add 25H and 34H and put the result in register A.
8. Write a program to add two 8-bit numbers and store it in R6. The numbers are 01EH and 01CH.
9. Subtract 21H from 30H and write the program and solve.
10. Write instructions to subtract 10H from 30H using immediate and register addressing.
11. Write a program to divide 95 by 10.
12. Write a program to multiply two 8 bit numbers stored at internal RAM address 10H and 11H. Store the result at address 12H (MSB) and 13H (LSB).

Chapter 12
C-Programming

One mark questions (Knowledge)

1. What is C programming language?
2. Name the person who developed C language.
3. What is case sensitivity in C language?
4. What do you mean by syntax?
5. What is a function in C language?
6. What is C pre-processor?
7. What is C compiler?
8. What is debugging a C program?
9. What is a syntax error?
10. What is logical error?
11. What is a runtime error?
12. What is testing a program?
13. What is character set of C language?
14. What are C tokens?
15. What are keywords in C?
16. What is an identifier in C?
17. What is a constant in C?
18. What is a character constant in C?
19. What is a string constant in C?
20. What is a variable in C?
21. Write the syntax for assigning values to variables.
22. What is a statement in C program?
23. What symbol or character is used to terminate every C statement?
24. What is an operator?
25. Write arithmetic operator used to represent remainder obtained in integer division.
26. What is a ternary operator or conditional operator?
27. Write the general syntax of ternary operator in C?
28. What is the meaning of the symbol '~'?
29. Name any one library function in C?
30. What is the use of function conio.h?
31. Which operator in C-language is also called as ternary operator?
32. What is symbolic constant in C?
33. Give a C language symbolic constant statement that will create a constant named MAX with value 100.
34. What is a newline escape sequence in C?
35. What does local variable mean in C?
36. What does global variable mean in C?
37. What is bitwise operator in C?
38. What is scanf ( )?
39. What is printf ( )?
40. Write the general form of 'scanf ( )' formatted input.

41. Write the general format of printf ( ) formatted output.
42. What is the syntax for ternary operator in C?
43. What is arithmetic operator in C?
44. What is assignment operator in C?
45. What is the relational operator in C?
46. What is the logical operator in C?
47. What is the difference between single equal "=" and double equal "==" operators in C?
48. What is the use of sizeof operator?
49. What is a break statement in C?
50. What is the use of clrscr ( ) function in C program?
51. What is a flowchart?

One mark questions (understanding)

1. How many types of constants are there in C language?
2. Where is conditional operator used?
3. How do you represent increment operator in C?
4. How do you represent decrement operator in C?
5. How many keywords are there in C-language?
6. How many decimal places are displayed when a number has a corresponding format specifier %f?
7. Why we use main ( ) function in every C program?
8. In which header file printf ( ) and scanf ( ) functions are declared?
9. In which header file getch ( ) and clrscr ( ) functions are declared?
10. How are comments included in a C program?

One mark questions (skill)

1. What is the value of 17% -2?
2. What is the value of -17%2?
3. Write the symbol of exclusive–OR operation.
4. Write syntax of continue statement?
5. Write syntax of continue break statement?

Two marks questions (knowledge)

1. List the features of C language.
2. Write the commonly used pre-processor directives in C?
3. List the different C tokens.
4. What is floating point constants? Give an example.
5. What is a character constant? Give an example.
6. What is a string constant? Give an example.
7. What is the use of main ( ) function in C?
8. What is the purpose of scanf ( ) and printf ( ) function in C program?
9. What is the use of "#define" in C?
10. What do you understand by data type? Give few examples of data types available in C.

11.Mention the decision control statements in C?
12.List the loop control statements in C?
13.What is the use of break statement? Write its syntax.
14.What is a header file? Write the syntax for including standard libraries into C Program.
15.Mention the four types of constants in C language.
16.What are delimiters? Mention commonly used delimiters in C language.
17.What are the symbols used for logical AND and logical OR operators in C?
18.What is character constant? Give an example.
19.What is string constant? Give an example.
20.What is header file? Name any one commonly used header files in C programs.
21.Write the syntax and flow chart of **if** statement in C?
22.Write the syntax and flow chart of **if-else** statement in C?
23.Write the syntax and flow chart of **while** statement in C?
24.Write the syntax and flow chart of **do-while** statement in C?
25.Name any two unconditional control statements in C.
26. List the arithmetic operators in C.
27. List the logical operators in C.
28.List the assignment operators in C.
29.List the relational operators in C.
30.List the bitwise operators in C.
31.What are unary operators? How many operands are associated with a unary operator?

Two marks questions (understanding)

1. Which characters comprise the C character set?
2. Write any two arithmetic operators and its meaning.
3. What is the meaning of a% b? Find the value of 21% 4.
4. For what purpose if-statement and if-else statement are used?
5. What is the difference between local and global variable in C?
6. What is the difference between constant and variable in C?
7. What is the difference between pre increment operator and post increment operator in C?
8. What is the difference between ‘x’ and “x” in C?
9. Differentiate between the expression “++a” and “a++” in C-language.
10. Differentiate between the expression “- -a” and “a- -” in C-language.
11. What is the difference between unary and binary operators in C?
12. What is the difference between <stdio.h> and <conio.h> header file?

Two marks questions (skill)

1. Given x=15 and y=4, what values do the expression x/y and (float) x/y yield, respectively?
2. Write the C equivalent expression for (2x +1) (3y +2).
3. 27. Draw any four symbols used while writing the flow chart.
4. 30. Evaluate the C logical expression a&&b||c&& (!b). Given a=2, b=4, and c=3.
5. If a=2, b=4 and c=7 then evaluate the C logical expression a&&b||c ||(!b).
6. What is the value of 2.5*4/2?

7. Find the value of the given C expression 3-5*2.5.
8. Find the value of the given C expression 20%5%2*3.
9. Find the value of the given C expression 10/ (2*3).
10. Find the value of the given C expression 22%3*12/3.

Three marks questions (knowledge)

1. List the features of C language.
2. Write the format of simple C program.
3. What is a syntax error? Give any two common syntax errors of C-language.
4. What is logical error? Given any two common logical errors of C-language.
5. Write the steps involved in executing C program.
6. What is data type? How many types of data types are there in C?
7. Mention the C tokens.
8. What do you mean by identifiers? Mention the rules to be followed while defining identifiers.
9. Mention the rules for constructing the variable name in C-language.
10. What are format specifiers? Write any three commonly used format specifiers in C programs.
11. Write the syntax and flow chart of nested-if statement in C.
12. Write the syntax and flow chart of switch statement in C.
13. Write a C program to find the largest from the two given numbers using if-else statement.

Three marks questions (understanding)

1. Discuss in detail the syntax errors, logical errors and run time errors.
2. Briefly explain the conditional operator (or ternary operator) in C.
3. What is the difference between int, char, and float data types?
4. Give any three differences between while and do-while loop statements in C?
5. Give memory requirement of integer type data, float type data and character type data in C?
6. Write a C program to find the area of a circle.
7. Write a C program to accept four numbers and compute their sum and average.
8. Explain for statement along with general syntax and flow chart.
9. Explain if-else statement along with general syntax and flow chart.
10. Explain while statement along with general syntax and flow chart.

Three marks questions (skill)

1. Write C expressions equivalent to the following algebraic expressions:
   (i)$\sqrt{a^2+b^2}$ and (iii) ax^2+bx+c (iii)$\sqrt{b^2-4ac}$
2. Convert the following mathematical expressions into C expressions:
   (i) $a+\frac{b}{c}+d$ (ii) $\frac{ab}{c-d}+d$ (iii) b^2-4ac
3. Explain the significance of the following control specifiers in C program:
   (i) %c (ii) %d (iii)%f

Five marks questions (knowledge)

1. Write the basic structure of C program and explain each section in brief.
2. Write the general syntax of following C statements:
   (i) if-else statement (ii) while statement (iii) do-while statement
   (iv) switch case statement and (v) for statement.
3. What is a variable in C language? Mention the rules for constructing variable names in C.

Five marks questions (understanding)

1. What are flowcharts? Give any four notations (symbols) used in a flow chart along with their names and uses?
2. Compare the three loop statements available in C language.
3. Explain do-while statement along with general syntax and flow chart.

Five marks questions (skill)

1. With the help of flow chart describe the process of creating and executing a C- program.
2. Write a C program to accept two numbers and print their sum, difference and product.
3. Write a C program to find the largest of given three numbers using nested if statement.
4. Write a C program to check a given number is even or odd.
5. Write a C program to print the sum of first n natural numbers using for loop.
6. Write a C program to print the sum of first n natural numbers using while loop.
7. Write a C program to print the sum of first n natural numbers using do-while loop.
8. Write a C program to find the roots of a quadratic equation (ax2+bx+c) = 0 for all possible combinations of a, b and c.

Chapter: 13
Modern Communication Systems

One mark questions (Knowledge)

1. What is cellular communication system?
2. What is meant by 'cell' related to mobile communication?
3. What is a call-handoff?
4. What is frequency reuse?
5. Expand MTSO.
6. Expand GSM.
7. Expand CDMA.
8. What is cell splitting?
9. What is Internet?
10. Expand ARPA.
11. Expand PDA.
12. Expand ISP.
13. What is a protocol?
14. Name the protocol used in Internet.
15. Define the World Wide Web (OR) what is WWW?
16. Expand URL.
17. What is a satellite?
18. What is transponder?
19. What is meant by optical fibre communication?
20. What is a communication satellite?
21. Define uplink signal.
22. Define downlink signal.
23. Define Wi-Fi.
24. What is Bluetooth?
25. What is a piconet?
26. Expand FHSS related to Bluetooth technology.
27. Expand FSK related to Bluetooth technology.
28. What is fiber optic cable?
29. What materials are commonly used for fiber optic cables?
30. Name the device which receives and transmits the signal from a satellite.
31. Expand RADAR.
32. What is RADAR?

One mark questions (Understanding)

1. Why adjacent cells are assigned different frequencies in mobile communication.
2. Why cells are in 'hexagon' shape during cell splitting?
3. Mention the frequency of uplink signal used in a C-band satcom system.
4. Mention the frequency of downlink signal used in a C-band satcom system.
5. Which band is preferred for the operation of Bluetooth devices?

Two marks questions (Knowledge)

1. State the different techniques used for improving capacity in cellular system.
2. Mention any two types of protocols used in computer networks.
3. What is a transponder and Mention its main function.
4. What are uplink and downlink signals in satellite communication?
5. Mention the important techniques used for Bluetooth operation.
6. What is ISP? Mention its role in computer networking.

Two marks questions (Understanding)

1. Explain what is meant by cell splitting.
2. Expand AMPS and TDMA.
3. Distinguish between uplink and downlink signals.
4. List the functions of a transponder.
5. If a transmitted signal takes 1ms to go up to the target and come back after reflection, how far from the radar the target is?
6. If a transmitted signal takes 1μs to go up to the target and come back after reflection, how far from the radar the target is?

Two marks questions (skill)

1. Draw the block diagram of a transponder.
2. Draw the block diagram of an optical fiber communication system.
3. Draw the block diagram of RADAR system.

Three marks questions (Knowledge)

1. Mention the advantages of cell phone systems.
2. Mention the uses of Internet.
3. Mention few applications of satellites.
4. Mention few applications of optical fiber communication.
5. Mention a few applications of Radar.
6. Give abroad classification of RADAR systems.
7. Mention the additional new features of the latest 3G and 4G cell phone systems compare to old 1G and 2G cell phones.

Three marks questions (Understanding)

1. Explain the principle of operation of Bluetooth.
2. Mention few applications of Bluetooth.
3. Give a comparison of Bluetooth and wi-fi.

Three marks questions (skill)

1. Draw the typical block diagram of Bluetooth system.

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