Question Bank for Introduction to Electronics and Communication (BESCK104C/204C)

Module – 1

Power Supplies

1. What is a regulated power supply? With neat block diagram, explain the working of DC power supply. Also mention the principal components used in each block.
   (Jul '23 – 8M, MQP '22 – 6M)
2. With a neat block diagram, explain the working of a DC power supply. Also mention the principal components used in each block. ***(Nov '23 – 7M, Aug '22 – 7M, MQP '21 – 7M)***
3. Describe the DC power supply with the help of block diagram. ***(Nov '23 – 8M, Jul '23 – 7M)***
4. Draw the block diagram of DC power supply and explain the individual blocks.
   (Feb '23 – 8M)
5. What is a rectifier? What are the different types of rectifiers?
6. Describe half-wave rectifier with circuit diagram and waveforms. ***(Jul '23 – 8M)***
7. With appropriate circuit diagram, explain the working of half-wave rectifier.***(Nov '23 – 8M)***
8. A mains transformer having a turns ratio of 44: 1 is connected to a 220 V r.m.s. mains supply. If the secondary output is applied to a half-wave rectifier, determine the peak voltage that will appear across a load. ***(Nov '23 – 4M)***
9. What is the need for reservoir and smoothing circuits? Explain.
10. Explain the working of a half-wave rectifier with reservoir capacitor along with relevant waveforms.
11. The R-C smoothing filter in a 50 Hz mains operated half-wave rectifier circuit consists of $R_1 = 100\ \Omega$ and $C_1 = 1{,}000\ \mu F$. If 1 V of ripple appears at the input of the circuit, determine the amount of ripple appearing at the output.
12. A half-wave rectifier is fitted with an R-C smoothing filter comprising $R = 200\ \Omega$ and $C = 50\ \mu F$. If 2 V of 400 Hz ripple appear at the input of the circuit, determine the amount of ripple appearing at the output.
13. Explain the working of bi-phase full wave rectifier circuit with neat diagram and waveforms.
    (Aug '22 – 7M, MQP '21 – 8M)
14. With appropriate circuit diagram, explain the working of full-wave rectifier. Draw the input and output waveforms. ***(Nov '23 – 12M)***
15. Explain full wave rectifier with necessary circuit diagrams and waveforms. ***(Jul '23 – 8M)***
16. With a neat circuit diagram, explain the working of a bi-phase rectifier along with relevant waveforms. Also explain how the output changes when a reservoir capacitor is used.
17. With neat circuit diagram and waveforms explain the working of a full wave bridge rectifier.
    (Jul '23 – 8M, Feb '23 – 8M, MQP '21 – 8M)

18. With a neat circuit diagram and waveforms, explain the working of bridge rectifier without filter. ***(Feb '22 – 8M)***

19. With a neat circuit diagram and waveform, explain the working of bridge rectifier with filter. ***(Nov '23 – 8M)***

20. With a neat circuit diagram, explain the working of a bridge rectifier along with relevant waveforms. Also explain how the output changes when a reservoir capacitor is used.

21. Discuss the need of filter circuit. With circuit diagram and waveforms, brief out the operation of smoothing filter for full wave rectifiers. ***(MQP '22 – 7M)***

22. What is voltage regulator? With neat circuit diagram, explain the operation of a voltage regulator using Zener diode. ***(Jul '23 – 7M)***

23. Draw the circuit diagram of voltage regulation and explain the operation. ***(Feb '23 – 6M)***

24. Explain the operation of a simple shunt Zener voltage regulator. ***(MQP '21 – 7M)***

25. A 5 V zener diode has a maximum rated power dissipation of 500 mW. If the diode is to be used in a simple regulator circuit to supply a regulated 5 V to a load having a resistance of 400 Ω, determine a suitable value of series resistor for operation in conjunction with a supply of 9 V. ***(MQP '22 – 7M)***

26. A 6 V zener diode has a maximum rated power dissipation of 500 mW. If the diode is to be used in a simple regulator circuit to supply a regulated 6 V to a load of 500 Ω, determine a suitable value of series resistor for a supply of 12 V. ***(Nov '23 – 5M, Feb '22 – 6M)***

27. If a 9 V zener diode is to be used in a simple shunt regulator circuit to supply a load having a nominal resistance of 300 Ω, determine the maximum value of series resistor for operation in conjunction with a supply of 15 V.

28. Explain the terms output resistance and voltage regulation with respect to voltage regulator.

29. The following data were obtained during a test carried out on a d.c. power supply:

    (i) Load test

    Output voltage (no-load) = 12 V

    Output voltage (2 A load current) = 11.5 V

    (ii) Regulation test

    Output voltage (mains input, 220 V) = 12 V

    Output voltage (mains input, 200 V) = 11.9 V

    Determine (a) the equivalent output resistance of the power supply and (b) the regulation of the power supply.

30. The following data were obtained during a load test carried out on a d.c. power supply:

    Output voltage (no-load) = 8.5 V

    Output voltage (800 mA load) = 8.1 V

    Determine the output resistance of the power supply and estimate the output voltage at a load current of 400 mA.

31. The following data were obtained during a regulation test on a d.c. power supply:

    Output voltage (a.c. input: 230 V) = 15 V

    Output voltage (a.c. input: 190 V) = 14.6 V

    Determine the regulation of the power supply and estimate the output voltage when the input voltage is 245 V.

32. What is voltage multiplier? With circuit diagram, explain the operation of voltage doubler. ***(Jul '23 – 6M)***

33. With circuit diagram explain the following: Voltage Doubler, Voltage Tripler ***(MQP '21 – 5M)***

34. Draw the circuit diagram of voltage doubler and the working operation. ***(Feb '23 – 6M)***

35. What is voltage multiplier and mention its applications? With circuit diagram brief out the operation of voltage tripler circuit. ***(MQP '22 – 7M)***

Amplifiers

1. What is an amplifier? Explain the types of amplifier. ***(Jul '23 – 4M)***
2. List and describe the main types of amplifiers. ***(MQP '21 – 7M)***
3. Classify different types of amplifier. ***(Jul '23 – 8M)***
4. With neat block diagram of an amplifier showing the input and output current and voltages provide the formula for voltage gain, current and power gain. ***(Nov '23 – 4M)***
5. Explain the following terms related to amplifier:

   (a) Gain (b) Input resistance (c) Output resistance
6. Define the following with respect to amplifier:

   (i) Input resistance (ii) Amplifier gain (iii) Bandwidth (iv) Phase shift ***(Nov '23 – 8M)***
7. Describe the terms: Gain, Input resistance, Bandwidth of amplifier. ***(Jul '23 – 5M)***
8. An amplifier produces an output voltage of 2 V for an input of 50 mV. If the input and output currents in this condition are, respectively, 4 mA and 200 mA, determine: (a) the voltage gain (b) the current gain (c) the power gain. ***(Jul '23 – 4M, Feb '23 – 6M)***
9. An amplifier produces an output voltage of 5 V for an input of 100 mV. If the input and output currents in this condition are 4 mA and 200 mA, find voltage, current and power gains. ***(Nov '23 – 4M)***
10. The following measurements were made during a test on an amplifier:
    $V_{in} = 250$ mV, $I_{in} = 2.5$ mA, $V_{out} = 10$ V, $I_{out} = 400$ mA
    Determine: (a) the voltage gain (b) the current gain (c) the power gain (d) the input resistance.
11. An amplifier has a power gain of 25 and identical input and output resistances of 600 Ω. Determine the input voltage required to produce an output of 10 V.

12. Write a note on frequency response characteristics of an amplifier circuit, clearly mentioning the half power frequencies. ***(MQP '21 – 6M)***
13. Mention the advantages of negative feedback in amplifiers circuits. With relevant equations and diagram, explain the concept of negative feedback.
(Jul '23 – 7M, Aug '22 – 7M, MQP '21 – 7M)
14. Discuss briefly a negative feedback amplifier with block diagram. ***(Feb '23 – 6M)***
15. With a neat block diagram, derive the expression for overall gain of a negative feedback amplifier. ***(Nov '23 – 6M, Feb '22 – 6M)***
16. Explain the concept of negative feedback with a neat diagram. Show how negative feedback stabilizes the overall gain of an amplifier.
17. An amplifier with negative feedback applied has an open-loop voltage gain of 50, and one-tenth of its output is fed back to the input (i.e. $\beta = 0.1$). Determine the overall voltage gain with negative feedback applied. If the amplifier's open-loop voltage gain increases by 20%, determine the percentage increase in overall voltage gain.
18. An amplifier with negative feedback applied has an open-loop voltage gain of 250, and 5% of its output is fed back to the input. Determine the overall voltage gain with negative feedback applied. If the open-loop voltage gain increases by 20% determine the new value of overall voltage gain.
19. An integrated circuit that produces an open-loop gain of 100 is to be used as the basis of an amplifier stage having a precise voltage gain of 20. Determine the amount of feedback required.
20. An amplifier produces an open-loop gain of 180. Determine the amount of feedback required if it is to be operated with a precise voltage gain of 50.
21. What are multi-stage amplifiers? Write different methods used for interstage coupling.
(Nov '23 – 6M)

Module – 2
Oscillators

1. What is an oscillator?
2. Explain the concept of positive feedback with a neat diagram. Show how positive feedback increases the overall gain of an amplifier.
3. An amplifier with a gain of 8 has 10% of its output fed back to the input. Determine the gain of the stage (a) with negative feedback (b) with positive feedback.
4. What is oscillator? And mention the conditions for oscillation. ***(Feb '23 – 6M)***
5. Explain the Barkhausens' criteria for oscillations.
6. Explain the operation of three-stage ladder RC network oscillator with neat circuit diagram.
(Jul '23 – 6M)
7. List and explain the conditions for sustained oscillations. Determine the frequency of oscillation of a three-stage ladder network in which $C = 10$ nF and $R = 10$ kΩ.

(Nov '23 – 6M, Jul '23 – 4M, MQP '22 – 6M, Aug '22 – 6M, MQP '21 – 6M)

8. A phase-shift oscillator is to operate with an output at 1 kHz. If the oscillator is based on a three-stage ladder network, determine the required values of resistance if three capacitors of 10 nF are to be used.
9. With circuit diagram, explain the operation of a Wien bridge oscillator. ***(Nov '23 – 8M, Feb '23 – 8M)***
10. With a neat circuit diagram, explain the working of Wien bridge oscillator using op-amp. ***(Feb '22 – 6M)***
11. Describe Wien bridge oscillator with circuit diagram and formula for frequency of oscillations. ***(Jul '23 – 7M)***
12. Explain the Barkhausen criteria for oscillations. In a Wien bridge oscillator, if $C_1 = C_2 = 100$ nF, determine the frequency of oscillations when $R_1 = R_2 = 1$ kΩ. ***(Jul '23 – 7M)***
13. In a Wien bridge oscillator based on an operational amplifier, if $C_1 = C_2 = 100$ nF, determine the output frequencies when (a) $R_1 = R_2 = 1$ kΩ and (b) $R_1 = R_2 = 6$ kΩ.
14. In a Wien bridge oscillator based on an operational amplifier, $C_1 = C_2 = 22$ nF. Determine the values of R_1 and R_2 required to produce an output at exactly 400 Hz.
15. What are multivibrators? Mention the different types of it. ***(Nov '23 – 8M)***
16. With suitable circuit diagram, explain single stage astable multivibrator using operational amplifier. ***(Nov '23 – 7M, MQP '22 – 7M, Aug '22 – 7M)***
17. Explain the operation of single stage astable multivibrator with its circuit diagram. ***(Jul '23 – 7M)***
18. Explain the operation of single stage astable Oscillator with its circuit diagram. ***(Feb '23 – 8M, MQP '22 – 7M)***
19. Describe the working of a single stage astable oscillator using an op-amp. ***(MQP '21 – 5M)***
20. With a neat circuit diagram and waveforms, describe the operation of crystal controlled oscillator. ***(Nov '23 – 7M, MQP '22 – 7M)***
21. Write a note on crystal controlled oscillators. ***(Nov '23 – 4M)***

Operational Amplifiers

1. What is an operational amplifier? Sketch the circuit symbol for an operational amplifier. Label each of the connections.
2. What is op-amp? Explain the various parameters of operational amplifier. ***(Jul '23 – 7M)***
3. Explain the following parameters of an op-amp: (a) Open-loop voltage gain (b) Closed-loop voltage gain (c) Input resistance (d) Output resistance
4. Explain the following operational amplifier parameters:
   (i) Open-loop voltage gain (ii) Closed-loop voltage gain (iii) Input offset voltage
   (iv) Slew rate ***(Nov '23 – 16M)***
5. Explain the following terms with reference to operational amplifiers:

(i) Open-loop voltage gain (ii) Input resistance (iii) Input offset voltage (iv) Slew rate ***(Jul '23 – 8M)***

6. Define the following operational amplifiers parameters and write their typical values: i) Open loop voltage gain ii) Output resistance iii) Slew rate ***(Feb '23 – 6M)***
7. Define the following with respect to operational amplifiers and write their typical values: i) Open loop voltage gain ii) Input offset voltage iii) Full power bandwidth and iv) Slew rate ***(Nov '23 – 8M, Feb '22 – 8M)***
8. During measurements on an operational amplifier under open-loop conditions, an output voltage of 12 V is produced by an input voltage of 1 mV. Determine the open-loop voltage gain expressed in dB.
9. An operational amplifier operating with negative feedback produces an output voltage of 2 V when supplied with an input of 400 μV. Determine the value of closed-loop voltage gain.
10. An operational amplifier with negative feedback applied produces an output of 1.5 V when an input of 7.5 mV is present. Determine the closed-loop voltage gain.
11. An operational amplifier has an input resistance of 2 MΩ. Determine the input current when an input voltage of 5 mV is present.
12. Explain the following parameters of an op-amp: (a) Input offset voltage (b) Full-power bandwidth (c) Slew rate
13. With the aid of a sketch, explain what is meant by the term 'slew rate'. Why is this important?
14. A perfect rectangular pulse is applied to the input of an operational amplifier. If it takes 4 μs for the output voltage to change from –5 V to +5 V, determine the slew rate of the device.
15. A wideband operational amplifier has a slew rate of 15 V/μs. If the amplifier is used in a circuit with a voltage gain of 20 and a perfect step input of 100 mV is applied to its input, determine the time taken for the output to change level.
16. Explain the ideal characteristics of an op-amp. ***(Jul '23 – 6M)***
17. Write a note on ideal characteristics of an operational amplifier. ***(Nov '23 – 5M, MQP '22 – 7M)***
18. What are characteristics of an ideal operational amplifier? ***(Jul '23 – 6M)***
19. List and explain the ideal and real characteristics of op-amp.
20. Describe three basic configurations for operational amplifiers. ***(Jul '23 – 8M)***
21. Explain how capacitors can be added to modify the frequency response of op-amps.
22. An inverting operational amplifier is to operate according to the following specification:

    Voltage gain = 100

    Input resistance (at mid-band) = 10 kΩ

    Lower cut-off frequency = 250 Hz

    Upper cut-off frequency = 15 kHz

23. With a neat circuit diagram and waveforms, explain the following op-amp circuits: (a) Voltage follower (b) Differentiator (c) Integrator (d) Comparator (e) Summing amplifier
24. Write a note on voltage follower using operational amplifier. ***(Nov '23 – 4M)***
25. Sketch the circuits of each of the following based on use of op-amp along with input and output waveforms:
    (i) Integrator (ii) Voltage follower (iii) Comparator ***(Jul '23 – 7M)***
26. Draw the circuit diagram and input and output waveform of the following operational amplifier circuits (i) Differentiator (ii) Integrator ***(Feb '23 – 6M)***
27. Sketch the circuits of each of the following based on use of Operational Amplifier (a) Differentiator (b) Integrator (c) Voltage follower ***(Nov '23 – 7M, MQP '22 – 6M)***
28. Sketch the circuit of each of the following based on the use of operational amplifiers
    (a) comparator (b) a differentiator (c) an integrator (d) Inverting Amplifier.
    (Aug '22 – 6M, MQP '21 – 8M)
29. With a neat circuit diagram, explain the working of integrator using op-amp. ***(Feb '22 – 6M)***
30. Explain a differentiator circuit with waveforms and circuit diagrams. ***(Jul '23 – 7M)***
31. With circuit diagram and waveform show how operational amplifier can work as a comparator. ***(MQP '21 – 6M)***
32. Explain the operation of summing amplifier using operational amplifier and write the output equation. ***(Feb '23 – 6M)***
33. An inverting amplifier is to be constructed having a mid-band voltage gain of 40, an input resistance of 5 kΩ and a frequency response extending from 20 Hz to 20 kHz. Devise a circuit and specify all component values required.
34. A summing amplifier with two inputs has $R_F = 10\ k\Omega$, and R_{IN} (for both inputs) of 2 kΩ. Determine the output voltage when one input is at -2 V and the other is $+0.5$ V.

Module – 3
Boolean Algebra and Logic Circuits

1. Convert the following binary numbers to decimal: ***(Nov '23 – 12M)***
   (i) 101110 (ii) 1110101.11 (iii) 110110100
2. Convert the following: ***(Jul '23 – 8M)***
   i. $(1AD.E0)_{16} = (?)_{10}$
   ii. $(37.625)_{10} = (?)_2$
   iii. $(110100111001.110)_2 = (?)_8$
   iv. $(345.AB)_{16} = (?)_2$
3. Convert the following: ***(Jul '23 – 6M)***
   i. $(2AB.8)_{16} = (?)_{10}$
   ii. $(416.12)_{10} = (?)_8$
   iii. $(25.375)_{10} = (?)_2$
   iv. $(16.2)_8 = (?)_{16}$

4. Convert the following numbers to its equivalent numbers and show the steps: ***(Feb '23 – 6M)***

   i) $(10110001101011.111100000)_2 = (?)_8$
   ii) $(10110001101011.11110010)_2 = (?)_{16}$
   iii) $(1010.011)_2 = (?)_{10}$

5. Convert Decimal to Binary: (i) 41 (ii)153 (iii)) 0.6875 (iv) 0.513 ***(MQP '22 – 8M)***

6. Convert Binary to Decimal: (i) 110111 (ii) 10101010 (iii) 0110 (iv) 100.1010 ***(MQP '22 – 8M)***

7. Convert the following: ***(MQP '22 – 6M)***

   i. $(110.1101)_2 = (?)_{10}$
   ii. $(847.951)_{10} = (?)_8$
   iii. $(CAD.BF)_{16} = (?)_{10}$

8. Convert the following:

   i. $(225)_{10} = (?)_2 = (?)_8 = (?)_{16}$
   ii. $(11010111)_2 = (?)_{10} = (?)_8 = (?)_{16}$
   iii. $(623)_8 = (?)_{10} = (?)_2 = (?)_{16}$
   iv. $(2AC5)_{16} = (?)_{10} = (?)_8 = (?)_2$

9. Convert the following: ***(Nov '23 – 8M)***

   a) $(306.D)_{16} = (?)_2$
   b) $(41)_{10} = (?)_2$
   c) Compute 1's complement of $(11101)_2$
   d) Compute 9's complement of $(0.3267)_{10}$

10. Convert the following: ***(MQP '22 – 8M)***

    a) $3A6.C58D_{(16)} = ?_{(8)}$
    b) $0.6875_{(10)} = ?_{(2)}$
    c) Compute the 9's complement of $25.639_{(10)}$
    d) Compute the 1's complement of $11101.0110_{(2)}$

11. i) Subtract using 10's complement method ***(Nov '23 – 6M)***
    M=72532, N=03250
    ii) Subtract using 2's complement method
    $M = 1010100, N = 1000100$

12. Perform the following operations: ***(Jul '23 – 8M)***

    i) $1101 - 0101$ using 2's complement method
    ii) $0110 - 0010$ using 2's complement method
    iii) $924 - 126$ using 9's complement method
    iv) $265 - 424$ using 10's complement method

13. Perform the following: ***(Jul '23 – 8M)***

    i) $(1010100)_2 - (1000100)_2$ using 1's complement and 2's complement method.
    ii) $(4456)_{10} - (34234)_{10}$ using 9's complement and 10's complement method.

14. Subtract the following using 10's complement: ***(Feb '23 – 6M)***

i) $(72532 - 3250)_{10}$
ii) $(3250 - 72532)_{10}$

15. Subtract using $(r - 1)$'s complement method ***(MQP '22 – 6M)***
    a) $4456_{(10)} - 34234_{(10)}$
    Subtract using r's complement method
    a) $1010100_{(2)} - 1000100_{(2)}$
16. Perform subtraction on the given numbers using 9's complement method:
    (a) 4,637 - 2,579 (b) 125 - 1,800
17. Perform subtraction on the given numbers using 10's complement method:
    (a) 2,043 - 4,361 (b) 1,631 – 745
18. Perform subtraction on the given binary numbers using 1's complement method:
    (a) 10011 - 10010 (b) 100010 - 100110
19. Perform subtraction on the given binary numbers using 2's complement method:
    (a) 1001 - 110101 (b) 101000 - 10101
20. Write down axiomatic definition of Boolean algebra. ***(MQP '22 – 6M)***
21. Mention the different theorems and postulates of Boolean algebra and prove each of them with truth table. ***(MQP '22 – 7M)***
22. Mention any 3 theorems of Boolean algebra and prove each of them. ***(Nov '23 – 6M)***
23. Mention the postulates and theorems of Boolean algebra. ***(Jul '23 – 8M)***
24. State and prove De Morgan's theorem with its truth table.
    (Nov '23 – 7M, Jul '23 – 6M, MQP '22 – 5M)
25. Using basic Boolean theorems, prove ***(Feb '23 – 6M)***
    i) $(x + y)(x + z) = x + yz$
    ii) $xy + xz + y\bar{z} = xz + y\bar{z}$
26. Simplify the Boolean function to minimum number of literals: ***(MQP '22 – 6M)***
    $(xy + x'y + yz)$
    $(x'y + x(y + z) + y'z')$
27. Simplify the following: ***(Nov '23 – 6M)***
    i) $x(x' + y)$
    ii) $xy + x'z + yz$
28. Simplify the following Boolean functions to minimum number of literals:
    iii) $x + x'y$
    iv) $x(x' + y)$
    v) $x'y'z + x'yz + xy'$
    vi) $xy + x'z + yz$
    vii) $(x + y)(x' + z)(y + z)$
29. Simplify the following expressions using Boolean Algebra: ***(Jul '23 – 7M)***
    i. $\bar{A}BC + AB\bar{C} + AB$
    ii. $A + BC + B$

30. Simplify the following: ***(MQP '22 – 6M)***
    i. $Y = AB + \bar{A}C + BC$
    ii. $Y = (A + \overline{B} + \overline{B})(A + \overline{B} + C)$
    iii. $Y = C(B + C)(A + B + C)$

31. Find the complement of the functions ***(Jul '23 – 8M)***
    i) $F_1 = x'yz' + x'y'z$
    ii) $F_2 = x(y'z' + yz)$
    using De Morgan's theorem.

32. Minimize the following function ***(MQP '22 – 7M)***
    a) $F(x, y, z) = xy + x'z + yz$
    Find the complement of the function F1 and F2
    $F1(x, y, z) = x'yz' + x'y'z$
    $F2(x, y, z) = x(y'z' + yz')$

33. Express the Boolean function
    i) $F = A + \overline{B}C$ in a sum of minterms form
    ii) $F = xy + \bar{x}z$ in a product of maxterms form ***(Feb '23 – 8M)***

34. Express the Boolean function $F = A + \overline{B}C$ in a sum of minterms form. ***(Jul '23 – 6M)***

35. Express the Boolean function $F = A + B'C$ in a sum of minterms. ***(Jul '23 – 6M)***

36. Express the Boolean function $F = A + BC$ in a sum of minterms. ***(MQP '22 – 6M)***

37. Express the Boolean function $F = xy + x'z$ in a product of maxterms.

38. Express the Boolean function $F = xy + \bar{x}z$ in a product of maxterms form.
    (Jul '23 – 6M, MQP '22 – 6M)

39. Explain SOP & POS with examples. ***(MQP '22 – 6M)***

40. What are logic gates? Write the graphic symbol, algebraic function and truth table of all 8 logic gates. ***(Nov '23 – 20M)***

41. Describe how NAND and NOR gates can be used as universal gates. ***(MQP '22 – 8M)***

42. Implement the following Boolean functions by using logic gates: ***(Jul '23 – 6M)***
    (i) $F_1 = xy' + x'z$ (ii) $F_2 = x'y'z + x'yz + xy'$

Combinational Logic

1. Write the step-by-step procedure to design a combinational circuit. ***(Feb '23 – 6M)***

2. Implement half adder using basic gates. ***(MQP '22 – 6M)***

3. Explain the working of half adder. ***(Jul '23 – 6M)***

4. Design a half adder with necessary logic diagram and expressions. ***(Jul '23 – 5M)***

5. With the help of truth table, explain the operation of full adder with sum and carry expressions, along with its circuit diagram. ***(Nov '23 – 7M)***

6. With the help of truth table explain the operation of full adder with its circuit diagram and reduce the expression for sum and carry. ***(MQP '22 – 7M)***

7. Describe the working of the full adder using basic gates. ***(MQP '22 – 8M)***
8. Explain the working of full adder. ***(Jul '23 – 6M)***
9. With the help of truth table, explain full adder using logic gates. ***(Aug '22 – 6M, Feb '22 – 8M, MQP '21 – 5M)***
10. Implement full adder circuit with its truth table and write the expressions for sum and carry. ***(Jul '23 – 6M)***
11. Implement full adder using two half adders and one OR gate. Write the equations for Sum and C_{out}. ***(Feb '23 – 8M)***
12. Design a full adder circuit using two half adders. ***(Jul '23 – 8M)***
13. Design a full adder using two half adders and an OR-gate. ***(MQP '21 – 8M)***

Module – 4
Embedded Systems

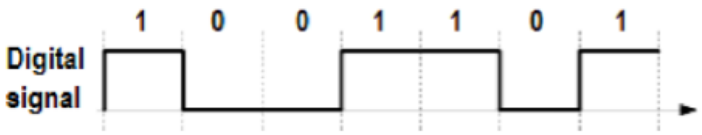
1. What is an embedded system? Compare embedded systems and general computer systems. ***(Jul '23 – 7M, Feb '23 – 8M)***
2. What is an embedded system? List any 7 comparisons between embedded system and general purpose computing system. ***(Feb '22 – 8M)***
3. Compare embedded systems and general computing systems. Also provide major application areas of Embedded Systems. ***(MQP '22 – 5M, Aug '22 – 8M, MQP '21 – 8M)***
4. Differentiate between a general purpose computing system and embedded system. ***(Nov '23 – 12M)***
5. Compare embedded system and general computing system (Any 5). ***(Nov '23 – 6M)***
6. Write a note on classification of embedded systems. Also provide applications of embedded systems. ***(Nov '23 – 8M)***
7. Explain the classification of embedded system. ***(Jul '23 – 6M)***
8. Write a note on classification of embedded systems. ***(MQP '22 – 6M, Aug '22 – 6M, MQP '21 – 6M)***
9. Mention the classification of embedded systems based on complexity and performance. ***(Feb '23 – 6M)***
10. Explain the classification of embedded system based on generation. ***(Feb '22 – 6M)***
11. Explain major application areas of embedded systems. ***(Jul '23 – 5M)***
12. Discuss major application areas of embedded systems with examples. ***(Jul '23 – 6M)***
13. What is an embedded system and brief about the different elements of an embedded system. ***(MQP '22 – 8M)***
14. Explain elements of an embedded system with the help of a block diagram. ***(Jul '23 – 8M)***
15. Discuss the typical embedded system elements. ***(Feb '23 – 8M)***

16. Write a note on core of an embedded system with its block diagram.
(Jul '23 – 7M, MQP '22 – 8M)
17. Compare microprocessors and microcontrollers. ***(Nov '23 – 8M, Jul '23 – 6M, Feb '22 – 6M)***
18. Bring out the differences between RISC and CISC, Harvard & Von-Neumann.
(Aug '22 – 6M, MQP '21 – 6M)
19. Compare RISC and CISC processors. ***(Nov '23 – 6M, Jul '23 – 6M, Feb '23 – 6M)***
20. With a neat block diagram, explain an instrumentation system. ***(Feb '22 – 8M)***
21. Using suitable diagrams, explain instrumentation and control systems.
(Nov '23 – 8M, Jul '23 – 7M)
22. Write a note on transducers. Explain one type of sensor and actuator with its operation.
(MQP '22 – 7M)
23. Give the classification of transducers with examples. ***(MQP '21 – 6M)***
24. Write a short note on: (i) Transducers (ii) Sensors. ***(Feb '23 – 6M)***
25. Define 'sensors' and give its classification with examples. ***(MQP '21 – 6M)***
26. Write a short note on:
(i) Sensors (ii) Actuators (iii) 7-segment LED display ***(Nov '23 – 6M)***
27. Explain the operation of an LED with neat diagram. Mention its applications.
28. Explain the working of a 7-segment LED with necessary diagrams. ***(Jul '23 – 8M)***
29. Write a short note on 7-segment LED display. ***(Feb '23 – 6M)***
30. Explain how 7-segment display can be used to display the data and write a brief note on operation of LED. ***(Jul '23 – 7M, MQP '22 – 7M)***
31. Write a note on 7-segment display. Write the two configurations in 7-segment display.
(Nov '23 – 8M)
32. With a neat circuit diagram, explain Common Cathode and Common Anode 7-segment LED display. ***(Feb '22 – 6M)***
33. Explain the different configurations of 7-segment LED Display.
(Aug '22 – 6M, MQP '21 – 6M)

Module – 5
Analog and Digital Communication

1. Draw the block diagram of basic communication system and briefly explain the individual blocks. ***(Feb '23 – 10M)***
2. With a neat block diagram of a basic communication system, explain modern communication system scheme. ***(Nov '23 – 12M)***
3. Brief about modern communication system with its block diagram.
(Nov '23 – 8M, MQP '22 – 7M)

4. Describe the blocks of modern communication system with neat block diagram. ***(Jul '23 – 8M)***
5. Describe communication system with the help of a block diagram. ***(Jul '23 – 8M)***
6. Describe the blocks of the basic communication system. ***(Aug '22 – 6M, Feb '22 – 8M, MQP '21 – 6M)***
7. Define the following terms: (i) Modulation (ii) Carrier communication system (iii) Baseband communication system with neat and suitable waveforms. ***(MQP '21 – 6M)***
8. Explain the types of communication system. ***(Feb '23 – 5M, Feb '22 – 6M)***
9. Describe the classification of RF (Radio Frequency) spectrum with applications in communications systems. ***(MQP '21 – 8M)***
10. Define noise. Derive the expression for Signal to Noise Ratio (SNR) in decibels (dB). ***(Jul '23 – 7M)***
11. Define and explain SNR, Noise Figure, channel types, amplitude modulation. ***(MQP '21 – 8M)***
12. Write a note on different types of modulation and briefly describe each in detail. ***(Nov '23 – 7M, MQP '22 – 8M)***
13. Define Amplitude Modulation. Explain amplitude modulation (AM) with necessary waveforms. ***(Nov '23 – 8M, Jul '23 – 7M, Feb '22 – 6M)***
14. What is modulation? Explain amplitude modulation (AM) and frequency modulation (FM) with neat diagrams. ***(Jul '23 – 8M)***
15. Define amplitude and frequency modulation. Sketch AM and FM waveforms.***(Feb '23 – 10M)***
16. Write a note on: (i) Amplitude Modulation (ii) Frequency Modulation (iii) Phase Modulation
17. List out the advantages of digital communication over analog communication. ***(Nov '23 – 6M, Jul '23 – 6M, 5M, Feb '23 – 5M, MQP '22 – 5M)***
18. Write a note on digital modulation techniques.
19. Explain the following with the help of waveforms: (i) ASK (ii) FSK (iii) PSK ***(Jul '23 – 6M)***
20. Consider the following binary data 1100101 and sketch the ASK, FSK & PSK modulated waveforms. ***(Nov '23 – 6M)***
21. Consider the following binary data and sketch the ASK, FSK & PSK modulated waveforms. ***(MQP '22 – 6M)***



22. Write a short note on Amplitude Shift Keying (ASK) modulator and demodulator. ***(Feb '23 – 10M)***
23. Explain with a neat diagram, the concept of radio wave propagation and its different types. ***(Nov '23 – 6M, Jul '23 – 7M, MQP '22 – 7M)***

24. With a neat diagram, explain the 3 different modes of propagation of the waves (Radio waves). ***(Nov '23 – 12M)***

25. What are the different types of radio wave propagation? Describe each type in detail. ***(Jul '23 – 8M)***

26. Explain different types of radio wave propagation with a neat diagram. ***(Aug '22 – 6M, MQP '21 – 6M)***

27. Explain three different modes of propagation of electromagnetic waves, with a neat diagram. ***(Feb '22 – 8M)***

28. Present the architecture of a wireless communication transmitter and its modulation scheme QPSK with waveforms and constellation diagrams. ***(MQP '21 – 6M)***

29. Describe about radio signal transmission and multiple access techniques. ***(Nov '23 – 7M, MQP '22 – 7M)***

30. Write a note on multiple access techniques. ***(Nov '23 – 8M)***

31. Explain different multiple access techniques. ***(Jul '23 – 5M)***

32. Discuss the various multiple access techniques used in cellular network. ***(Aug '22 – 6M, MQP '21 – 6M)***

33. Discuss various multiple access techniques used in communication systems. ***(Jul '23 – 5M)***