

ANDHRA UNIVERSITY
1st YEAR B.Sc., I SEMESTER
CBSC SEMESTER SYSTEM WITH EFFECT FROM 2020-2021
Subject: ELECTRONICS
Paper: CIRCUIT THEORY AND ELECTRONIC DEVICES

Time: 2 Hours

Maximum Marks: 70

All questions carry equal marks (1M)

1. Which of the following materials is typically used as a good conductor of electricity?
A) Rubber
B) Glass
C) Copper
D) Plastic
2. In a series circuit, the total resistance is equal to
A) The sum of individual resistances
B) The product of individual resistances
C) The reciprocal of individual resistances
D) The average of individual resistances
3. Which of the following components opposes the change in current flow in a circuit?
A) Resistor
B) Capacitor
C) Inductor
D) Transformer
4. What is the phase difference between voltage and current in a purely capacitive circuit?
A) Voltage leads current by 90°
B) Voltage lags current by 90°
C) Voltage and current are in phase
D) Voltage and current are 180° out of phase
5. The effective (RMS) value of an AC voltage waveform is
A) Its average value
B) Half of its peak value
C) Its peak value divided by $\sqrt{2}$
D) Its peak value multiplied by $\sqrt{2}$
6. Which of the following is a characteristic of an insulator?

A) Low resistance to electric current

B) High resistance to electric current

C) Allows current to flow easily

D) Is a good conductor of electricity

7. The process of converting AC to DC is called:

A) Rectification

B) Amplification

C) Oscillation

D) Modulation

8. The frequency of an AC supply in many countries is:

A) 60 Hz

B) 50 Hz

C) 100 Hz

D) 120 Hz

9. Three resistors of 6 ohms, 8 ohms, and 12 ohms are connected in parallel.

What is the total resistance?

A) 6 ohms

B) 4 ohms

C) 12 ohms

D) 2 ohms

10. In a series circuit, resistors of 8 ohms, 12 ohms, and 20 ohms are connected. What is the total resistance?

A) 30 ohms

B) 40 ohms

C) 50 ohms

D) 42 ohms

11. A device operates at a power of 500W with a current of 10A. What is the voltage across the device?

A) 5V

B) 50V

C) 100V

D) 50.5V

12. The average value of a periodic waveform like a sine wave over a complete cycle is _____

13. Match the AC Parameter with Unit (4M)

A) Frequency

1) Volts (V)

B) Amplitude

2) Hertz (Hz)

C) Phase Angle

3) Ohms (Ω)

D) Impedance

4) Degrees ($^{\circ}$)

14. Which method is used to analyze electrical circuits by determining currents in each branch?

- A) Nodal Analysis
B) Thevenin's Theorem
C) Norton's Theorem
D) Branch Current Method

15. When converting a star-connected network to a delta-connected network, how many resistors are used in the delta configuration for n resistors in the star?

- A) $2n$
B) $n-1$
C) $n+1$
D) n

16. What theorem states that the response in a linear circuit with multiple sources is the sum of responses caused by individual sources acting alone?

- A) Superposition Theorem
B) Thevenin's Theorem
C) Norton's Theorem
D) Milliman's Theorem

17. Thevenin's Theorem helps simplify a network into an equivalent circuit composed of what elements?

- A) Only resistors
B) Voltage source and resistor
C) Voltage source and current source
D) Only capacitors

18. In which condition is the maximum power transferred from a source to a load?

- A) Load resistance equals source resistance
B) Load resistance is infinite
C) Load resistance is zero
D) Load resistance is half the source resistance

19. In a circuit, the Thevenin voltage is 12V and the Thevenin resistance is 4Ω . What is the Thevenin equivalent for a load resistance of 6Ω ?

- A) 9V
B) 8V
C) 6V
D) 4V

20. For a circuit with Norton equivalent current 10A and Norton equivalent resistance 5Ω , what is the Norton equivalent resistance for a load resistance 8Ω ?

- A) 5Ω
B) 4Ω
C) 13Ω
D) 8Ω

21. In a purely inductive circuit, the phase difference between current and voltage is _____ degrees.

22. Norton's Theorem states that any linear circuit with several current sources and resistors can be replaced by a single current source in _____ with an equivalent resistance.

23. The product of voltage and current in an electrical circuit gives the measure of _____ dissipation.

24. The equivalent resistance of resistors connected in parallel is _____ than the largest resistance present in the combination.

25. What is the main limitation of the Branch Current Method in analyzing circuits?

A) It's not applicable for determining total resistance in parallel configurations.

B) It requires additional equations for loops involving voltage sources.

C) It struggles to handle circuits with a large number of nodes.

D) It can't be used for circuits with multiple sources.

26. Which statement accurately describes the Branch Current Method?

A) It focuses on analyzing nodal voltages in a circuit.

B) It determines the current flowing through each branch in a network.

C) It simplifies circuits by transforming delta configurations into star configurations.

D) It calculates equivalent resistances in parallel circuits.

27. When performing a delta-to-star conversion, what effect does it have on the number of connections and their configuration?

A) Increases the number of connections and rearranges their configuration.

B) Decreases the number of connections without changing their configuration.

C) Rearranges the connections without affecting their number.

D) Neither changes the number of connections nor their configuration.

28. When applying the Reciprocity Theorem, what is essential about the response in a linear network?

- A) The voltage across an element is equal to the current through it.
- B) The circuit response is independent of source characteristics.
- C) The power dissipated is directly proportional to the resistance.
- D) The capacitance and inductance are reciprocally related.

29. What happens to the cutoff frequency of an RC low-pass filter when the resistance (R) is doubled and the capacitance (C) is halved?

- A) It doubles.
- B) It remains the same.
- C) It halves.
- D) It quadruples.

30. In a series RL circuit, if the inductance is doubled and the resistance is halved, the resonant frequency will

- A) Double.
- B) Halve.
- C) Remain constant.
- D) Quadruple.

31. In an RL circuit, if the inductance is increased and the frequency is decreased, the reactance of the inductor will

- A) Increase.
- B) Decrease.
- C) Remain constant.
- D) Fluctuate.

32. For an RC circuit, if the frequency is increased beyond the cutoff frequency, the output voltage tends to approach:

- A) Zero.
- B) Maximum.
- C) The input voltage.
- D) Negative infinity.

33. An RL circuit acts as a low-pass filter, allowing ----- frequencies to pass through and attenuating ----- frequencies.

34. An RL circuit functioning as a high-pass filter tends to attenuate ----- frequencies and allows ----- frequencies to pass through.

35. What happens to the output of a differentiator when the frequency of the input signal increases beyond the circuit's cutoff frequency?

36. In a differentiating circuit, what is the relationship between the input and output waveforms for a square wave input?

37. At resonance in a series circuit, the impedance of the inductor and the capacitor -----, resulting in maximum ----- across the circuit.

38. In a parallel resonance circuit, the overall impedance is at resonance due to the of the inductive and capacitive reactances.
39. At resonance in a parallel circuit, the circuit exhibits maximum and minimum
40. The Q-factor in a resonance circuit is a measure of its and is calculated as the ratio of to
41. A high Q-factor indicates a response and a narrow bandwidth.
42. The term "punch-through" in a BJT refers to
- A) Collector-base breakdown
 - B) High emitter-base voltage
 - C) Reverse saturation current
 - D) Low base-collector voltage
43. Which region of a BJT transistor provides the greatest amplification?
- A) Saturation
 - B) Active
 - C) Cut-off
 - D) Reverse bias
44. What is the purpose of a Darlington pair in transistor circuits?
- A) To decrease the current gain
 - B) To increase the current gain
 - C) To lower the voltage gain
 - D) To decrease the power dissipation
45. The common-emitter current gain of a transistor is known as:
- A) Alpha (α)
 - B) Beta (β)
 - C) Gamma (γ)
 - D) Delta (δ)
46. The parameter that measures the change in collector current with respect to the change in collector-emitter voltage is:
- A) Transconductance
 - B) Early voltage
 - C) Output resistance
 - D) Cut-off frequency
47. The FET region between the source and drain, controlled by the gate voltage, is the region.
48. The most commonly used FET configuration for amplification purposes is the configuration.

49. In an n-channel JFET, the gate is _____-biased.
50. The parameter that measures the change in drain current concerning the change in gate-source voltage in the FET is known as _____.
51. The output characteristic curve of a FET shows the relationship between the drain current and _____.
52. The FET region with reverse-biased gate-source junction is the _____ region.
53. The transconductance parameter for a FET is a measure of its ability to convert changes in _____ voltage into changes in _____ current.
54. In a UJT, what happens to the voltage across the device when it's triggered?
- A) Decreases abruptly
B) Increases abruptly
C) Remains constant
D) Oscillates continuously
55. In what configuration is a UJT commonly used to generate pulses in timing circuits?
- A) Common-emitter
B) Common-base
C) Oscillator configuration
D) Relaxation oscillator
56. In a UJT, the region between the emitter and the first base region is called the
- A) Emitter
B) Anode
C) Peak point
D) Intrinsic standoff region
57. The primary function of a rectifier in an electrical circuit is to:
- A) Amplify signals
B) Convert AC to DC
C) Filter high-frequency noise
D) Generate sinusoidal waves
58. A half-wave rectifier converts:
- A) Half of the AC input cycle to DC
B) The entire AC input cycle to DC
C) The negative half of the input cycle to DC
D) Alternating voltages to sinusoidal waves

59. In a full-wave bridge rectifier, the output waveform is:
- A) Unidirectional
 - B) Bidirectional
 - C) Pulsating DC
 - D) Pure DC
60. The efficiency of a full-wave rectifier is approximately:
- A) 25%
 - B) 50%
 - C) 75%
 - D) 100%
61. In a rectifier circuit, the output across the load is _____ when a filter capacitor is used.
- A) Pulsating DC
 - B) Pure DC
 - C) AC
 - D) No output
62. In a bridge rectifier, the number of diodes used is:
- A) One
 - B) Two
 - C) Three
 - D) Four
63. In a half-wave rectifier, the diode conducts current during the:
- A) Positive half-cycle of the input voltage
 - B) Negative half-cycle of the input voltage
 - C) Entire cycle of the input voltage
 - D) No cycle of the input voltage
64. The purpose of a filter in a rectifier circuit is to:
- A) Increase output voltage
 - B) Decrease output voltage
 - C) Eliminate ripple voltage
 - D) Increase rectifier efficiency
65. The middle terminal of a three-terminal fixed voltage IC regulator serves as the _____ terminal.
66. The output terminal of a three-terminal fixed voltage IC regulator provides a _____ voltage.
67. The primary function of a three-terminal fixed voltage IC regulator is to maintain a _____ output voltage regardless of variations in the input voltage or load current.

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**2nd YEAR B.Sc., III
SEMESTER**

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Subject: ELECTRONICS

Paper: ANALOG CIRCUITS AND COMMUNICATION

Time: 2 Hours

Maximum Marks: 70

All questions carry equal marks (1M)

1. The input impedance of an ideal op-amp is typically:

- A) Zero ohms
- B) Very high
- C) Very low
- D) Variable

2. Which block in the op-amp block diagram provides the highest voltage gain?

- A) Differential amplifier
- B) Input stage
- C) Output stage
- D) Feedback network

3. An op-amp operates in open-loop configuration when:

- A) Feedback is applied
- B) No feedback is applied
- C) Both input terminals are at the same voltage
- D) The output is shorted to ground

4. The phase shift of an ideal op-amp in open-loop configuration is typically:

- A) 90 degrees
- B) 180 degrees
- C) 270 degrees
- D) 360 degrees

5. Op-Amp Configurations:

The summing amplifier configuration of op-amps is also known as:

- A) Differential amplifier
- B) Integrating amplifier
- C) Comparator
- D) Virtual ground amplifier

6. The common-mode rejection ratio (CMRR) of an op-amp measures its ability to reject:

- A) Common-mode signals
- B) Differential-mode signals
- C) Noise in the output
- D) Power supply variations

7. A differential amplifier rejects or cancels out signals that are:
- A) Common to both inputs
 - B) Different between inputs
 - C) In phase with each other
 - D) Opposite in phase with each other
8. A logarithmic amplifier generates an output that is proportional to the:
- A) Exponential of the input signal
 - B) Logarithm of the input signal
 - C) Square of the input signal
 - D) Reciprocal of the input signal
9. In an ideal integrator, the gain is:
- A) High for low frequencies
 - B) Low for low frequencies
 - C) Constant for all frequencies
 - D) Variable for different input amplitudes
10. The logarithmic amplifier provides a response that is:
- A) Linear
 - B) Exponential
 - C) Logarithmic
 - D) Oscillatory
11. A _____ is an operational amplifier configuration that has unity gain, meaning the output voltage replicates the input voltage without amplification or attenuation.
12. A _____ circuit, often configured using an op-amp, computes the difference between two input voltages, resulting in an output voltage proportional to their algebraic difference.
13. A _____ maintains a constant output voltage regardless of changes in input voltage or load conditions, ensuring stability in electronic circuits.
14. A _____ is a device or circuit that compares two input voltages and produces an output based on their relative magnitudes.
15. The primary function of a voltage _____ is to ensure a steady and regulated output voltage despite variations in input voltage or load resistance.
16. An _____ amplifier is adept at reducing noise and amplifying weak signals often found in sensors or transducers.
17. A comparator's output is typically a digital signal, providing a logic _____ based on the comparison of input voltages.
18. An _____ amplifier offers high common-mode rejection, making it suitable for measuring differential signals in noisy environments.
19. The primary characteristic of a Schmitt trigger is its ability to:
- A) Provide high-frequency amplification
 - B) Regenerate noisy signals
 - C) Generate a square wave output

- D) Convert square waves into sine waves
20. The output waveform of a sine wave generator is characterized by its:
- A) Constant amplitude
 - B) Square wave nature
 - C) Triangular waveform
 - D) Smooth, oscillating nature
21. The IC-555 timer is commonly used in applications such as:
- A) Voltage regulation
 - B) Digital signal processing
 - C) Timer circuits, pulse generation, and oscillators
 - D) Voltage amplification
22. Which of the following is a primary function of the IC-555 timer?
- A) Phase shifting
 - B) Frequency modulation
 - C) Pulse-width modulation
 - D) Signal amplification
23. In pulse-width modulation (PWM), the IC-555 timer is utilized to:
- A) Generate constant frequency signals
 - B) Vary the amplitude of the signal
 - C) Vary the duty cycle of the output waveform
 - D) Maintain a stable output voltage
24. A band-pass filter is most effective in applications involving:
- A) Signal amplification
 - B) Frequency rejection
 - C) Frequency selection
 - D) Voltage regulation
25. Modulation allows for efficient transmission by:
- A) Reducing antenna size
 - B) Converting digital to analog signals
 - C) Multiplexing signals
 - D) Limiting signal propagation
26. The representation of an AM wave involves:
- A) Mixing two carrier waves
 - B) Multiplying two signals
 - C) Adding two signals
 - D) Differentiating two signals
27. In an AM wave, the power carried by the carrier is _____ compared to the total power of the modulated signal.
- A) Less than
 - B) Equal to
 - C) Greater than
 - D) Unrelated to
28. Amplitude modulation is used predominantly in:
- A) Analog TV broadcasting
 - B) Satellite communication
 - C) Fiber optics
 - D) Wireless charging systems
29. The bandwidth of an AM signal is typically:
- A) Narrower than the modulating signal
 - B) Equal to the modulating signal

C) Wider than the modulating signal D) Unrelated to the modulating signal

30. In amplitude modulation (AM), a transistor modulator operates in the _____ region to generate the modulated signal.
31. The base of the transistor modulator is connected to the _____ signal.
32. The modulating signal is typically applied to the _____ terminal of the transistor modulator.
33. During modulation, the amplitude of the carrier signal varies in accordance with the _____ signal.
34. The diode detector, also known as an envelope detector, uses a diode to rectify the _____ signal.
35. A _____ is used across the diode in a diode detector to filter the rectified signal.
36. The diode detector operates in the _____ region of the diode's characteristic curve.
37. Frequency Modulation (FM) is a form of modulation where the instantaneous frequency of the carrier signal varies in accordance with the _____ signal.
38. The measure of the maximum frequency shift from the carrier frequency in FM is known as _____.
39. Modulation Index (MI) is defined as the ratio of the _____ deviation to the maximum frequency of the modulating signal.
40. Deviation Ratio is the ratio of the _____ to the maximum permissible deviation in FM.
41. Percent Modulation expresses the percentage of the _____ deviation relative to the carrier frequency.
42. In Frequency Modulation, the frequency spectrum comprises a carrier frequency and an infinite number of _____.
43. The bandwidth of an FM signal is directly proportional to the _____ of the modulating signal.
44. Carson's Rule estimates the bandwidth of an FM signal and considers the maximum frequency deviation and _____ frequency of the modulating signal.
45. The wider the frequency deviation or modulation index in FM, the _____ the bandwidth required for transmission.
46. The reactance modulator modulates the frequency by altering the:

- A) Resistance in response to input voltage
 - B) Capacitance in response to input voltage
 - C) Inductance in response to input voltage
 - D) Conductance in response to input voltage
47. The discriminator in FM demodulation functions by utilizing:
- A) Resonant circuits
 - B) Non-linear amplifiers
 - C) Phase-locked loops
 - D) Phase shift networks
48. Reactance modulators change the frequency by adjusting the:
- A) Resistance based on the input voltage
 - B) Capacitance based on the input voltage
 - C) Inductance based on the input voltage
 - D) Conductance based on the input voltage
49. FM demodulation with a discriminator relies on the detection of variations in the input signal's:
- A) Amplitude
 - B) Frequency
 - C) Phase
 - D) Energy
50. Varactor diode modulators change their capacitance in response to changes in:
- A) Voltage and temperature
 - B) Frequency and phase
 - C) Current and resistance
 - D) Power and frequency
51. The bandwidth allocated for FM radio broadcasting is generally in the range of:
- A) Kilohertz (kHz)
 - B) Megahertz (MHz)
 - C) Gigahertz (GHz)
 - D) Terahertz (THz)
52. In radio broadcasting, the modulation process adds information to the:
- A) Carrier wave
 - B) Antenna
 - C) Receiver
 - D) Amplifier
53. The primary purpose of the antenna in a radio transmitter is to:
- A) Amplify signals
 - B) Tune signals
 - C) Transmit signals into space
 - D) Demodulate signals
54. Radio broadcasting primarily involves the transmission of signals in the form of:
- A) Electric current
 - B) Electromagnetic waves
 - C) Mechanical vibrations
 - D) Infrared radiation
55. In radio reception, the component responsible for capturing radio waves is the:
- A) Amplifier
 - B) Antenna

- C) Tuner
D) Speaker
56. Radio waves occupy which portion of the electromagnetic spectrum?
A) Ultraviolet spectrum
B) Infrared spectrum
C) Microwave spectrum
D) Gamma-ray spectrum
57. The straightforward receiver consists of an _____, _____, and _____.
58. The _____ in the straightforward receiver is primarily responsible for tuning to the desired frequency.
59. In the superheterodyne receiver, the incoming RF signal is mixed with the _____ signal to produce an _____ frequency.
60. FM receivers use a _____ to convert frequency variations into corresponding variations in _____.
61. Discriminators in FM receivers primarily function to convert frequency variations to _____ variations.
62. The output of the FM detector in FM receivers is the _____ signal.
63. The superheterodyne receiver's advantage lies in its superior _____ and _____ compared to straightforward designs.
64. In amplitude modulation (AM), if the carrier signal has an amplitude of 10 V and the modulation index is 0.6, the peak amplitude of the modulated signal is _____ V.
65. For frequency modulation (FM), if the carrier frequency is 100 MHz and the frequency deviation is ± 50 kHz, the maximum and minimum frequencies of the modulated signal are _____ MHz and _____ MHz, respectively.
66. In phase modulation (PM), if the carrier wave's phase shift due to the modulating signal is $\pi/3$ radians, and the modulating signal has a frequency of 10 kHz, the phase modulation index is _____ radians per kilohertz.
67. For an inverting amplifier with a feedback resistor of 10 k Ω and an input resistor of 2 k Ω , if the input voltage is 5 V, what is the output voltage? (Assume ideal op-amp behavior)
A) 25 V
B) -25 V
C) -5 V
D) 5 V
68. In a non-inverting amplifier configuration with a feedback resistor of 8 k Ω and an input voltage of 2 V, if the open-loop gain of the op-amp is 100, what is the output voltage? (Consider ideal op-amp characteristics)

- A) 25 V
- B) -25 V
- C) 25.6 V
- D) 20 V

69. For an op-amp circuit acting as a voltage follower with an input voltage of 10 V and an ideal op-amp, what is the output voltage?

- A) 10 V
- B) -10 V
- C) Varies based on the op-amp model
- D) 0 V

70. In an inverting amplifier configuration with a feedback resistor of 4 k Ω and an input resistor of 1 k Ω , if the input voltage is 3 V, what is the gain of the amplifier?

- A) 1
- B) 2
- C) 3
- D) 4