



**SECTION A**

**PART I: Multiple Choice Questions (30 marks)**

**Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.**

1. Which of the following is a type of non-volatile memory?
  - a) RAM
  - b) ROM
  - c) Cache
  - d) Register
  
2. What does "LED" stand for in electronics?
  - a) Light Emitting Device
  - b) Low Energy Device
  - c) Light Emitting Diode
  - d) Light Energy Diode
  
3. Which of the following components is used to store electrical energy in an electric field?
  - a) Resistor
  - b) Inductor
  - c) Capacitor
  - d) Transformer
  
4. In a transistor, the region between the emitter and collector is called:
  - a) Base
  - b) Gate
  - c) Drain
  - d) Source
  
5. Which modulation technique is used for transmitting digital data over analog communication channels?
  - a) Amplitude Modulation (AM)
  - b) Frequency Modulation (FM)
  - c) Phase Modulation (PM)
  - d) Quadrature Amplitude Modulation (QAM)
  
6. What is the primary purpose of a diode in electronic circuits?
  - a) To amplify signals
  - b) To rectify AC to DC
  - c) To filter signals
  - d) To oscillate signals

7. Which of the following is a digital logic gate?
- a) Transformer
  - b) Diode
  - c) AND gate
  - d) Capacitor
8. Which type of memory is typically used for the main memory in a computer system?
- a) ROM
  - b) EEPROM
  - c) SRAM
  - d) DRAM
9. The speed of light in vacuum is approximately:
- a)  $3 \times 10^6$  m/s
  - b)  $3 \times 10^7$  m/s
  - c)  $3 \times 10^8$  m/s
  - d)  $3 \times 10^9$  m/s
10. In a frequency modulation (FM) system, the frequency deviation is proportional to:
- a) Amplitude of the modulating signal
  - b) Frequency of the modulating signal
  - c) Phase of the modulating signal
  - d) None of the above
11. What is the purpose of an operational amplifier in electronic circuits?
- a) To amplify voltage
  - b) To store charge
  - c) To convert AC to DC
  - d) To regulate voltage
12. In an AC circuit, the power factor is the ratio of:
- a) Real power to apparent power
  - b) Apparent power to real power
  - c) Real power to reactive power
  - d) Reactive power to apparent power
13. Which of the following is used to measure electrical resistance?
- a) Voltmeter
  - b) Ammeter
  - c) Ohmmeter
  - d) Wattmeter

14. Which device is used to increase or decrease AC voltage?
- a) Diode
  - b) Capacitor
  - c) Transformer
  - d) Resistor
15. In a digital communication system, what does the term "bit rate" refer to?
- a) The number of bits transmitted per second
  - b) The number of bytes transmitted per second
  - c) The number of signals transmitted per second
  - d) The number of channels transmitted per second
16. Which type of semiconductor is created by adding pentavalent impurities?
- a) Intrinsic semiconductor
  - b) P-type semiconductor
  - c) N-type semiconductor
  - d) Compound semiconductor
17. Which of the following communication modes allows data transmission in both directions simultaneously?
- a) Simplex
  - b) Half-duplex
  - c) Full-duplex
  - d) Multiplex
18. What is the primary function of a relay in an electronic circuit?
- a) To store energy
  - b) To act as a switch
  - c) To amplify signals
  - d) To filter signals
19. In an RC circuit, what does "RC" stand for?
- a) Resistor-Capacitor
  - b) Reactive-Capacitive
  - c) Real-Current
  - d) Resistance-Conductance
20. The main advantage of using fiber optic cables over copper cables is:
- a) Lower cost
  - b) Higher bandwidth
  - c) Easier installation
  - d) Higher resistance to electrical interference

21. Which of the following is a unipolar device?
- a) Diode
  - b) Bipolar Junction Transistor (BJT)
  - c) Field-Effect Transistor (FET)
  - d) Thyristor
22. In a communication system, noise is most likely to affect the signal during which of the following processes?
- a) Modulation
  - b) Transmission
  - c) Reception
  - d) Demodulation
23. What is the primary purpose of a capacitor in an electronic circuit?
- a) To store energy in an electric field
  - b) To convert AC to DC
  - c) To amplify signals
  - d) To control the frequency of oscillation
24. Which modulation technique is used for transmitting digital data over analog systems?
- a) Amplitude Modulation (AM)
  - b) Frequency Modulation (FM)
  - c) Pulse Code Modulation (PCM)
  - d) Phase Modulation (PM)
25. In a superheterodyne receiver, what is the function of the mixer?
- a) To amplify the received signal
  - b) To filter the received signal
  - c) To convert the received signal to an intermediate frequency
  - d) To demodulate the received signal
26. Which type of antenna is most commonly used for satellite communication?
- a) Dipole antenna
  - b) Yagi-Uda antenna
  - c) Parabolic dish antenna
  - d) Loop antenna
27. The Nyquist rate is defined as:
- a) Twice the highest frequency present in the signal
  - b) Half the highest frequency present in the signal
  - c) The same as the highest frequency present in the signal
  - d) Four times the highest frequency present in the signal

28. Which of the following components is used to isolate different sections of a circuit?
- Resistor
  - Capacitor
  - Transformer
  - Inductor
29. In an RC circuit, what is the time constant ( $\tau$ ) defined as?
- $R + C$
  - $R * C$
  - $R / C$
  - $C / R$
30. Which of the following describes the main function of an operational amplifier (op-amp)?
- To rectify AC signals
  - To filter signals
  - To amplify voltage
  - To convert digital signals to analog

**PART II – Short Answer Questions [20 marks]**

**This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.**

1. What is the purpose of a rectifier in an electronic circuit? How does an Analog-to-Digital Converter (ADC) work?
2. What is the function of an inductor in an electronic circuit? How does a capacitor store energy?
3. What is a transistor used for in electronic circuits? How does an operational amplifier (op-amp) work?
4. What is an oscillator used for in electronics? How do you measure the frequency of a signal using an oscilloscope?

**SECTION B: Case Study (50 marks)**

**Choose either CASE I or CASE II from this section. Each case study carries 50 marks.**

**CASE I**

Describe in detail the implementation of an Integrated Communication System for a Smart City?

**CASE II**

How can we implement an IoT-based Smart Parking System in an Urban Area? The project should include assessment, infrastructure requirements, applications.

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