Register No.:

9004

October 2025

Time – Two hours
(Maximum Marks: 60)

N.B.
1. Answer all questions under Part-A. Each question carries 1 mark.
2. Answer any 5 questions under Part-B. Each question carries 2 marks.
3. Answer any 3 questions under Part-C. Each question carries 10 marks.

PART – A

1. State the term for resistance of a material to deformation under load.
   a) Hardness
   b) Toughness
   c)Strength
   d) Elasticity

2. What is the main element in ferrous alloys?
   a) Iron
   b) Copper
   c) Nickel
   d) Aluminum

3. A steel bar of 20 mm diameter is subjected to 50 kN tensile load. Calculate stress.
   a) 159 MPa
   b) 200 MPa
   c)125 MPa
   d) 100 MPa

4. Which of the following statements is correct regarding Hooke's law?
   a) Hooke's law is only valid for materials that deform plastically.
   b) Hooke's law is only valid within the elastic limit of a material.
   c) Hooke's law applies to all materials, regardless of their elasticity.
   d) Hooke's law states that stress is independent of strain.

5. A circular bar of 20 mm diameter,length 1m, elongates 1 mm under 50 kN. Calculate linear strain.
   a) 0.001
   b) 0.002
   c) 0.005
   d) 0.0005

6. Which material typically exhibits a high Poisson's ratio?
   a) Steel
   b) Rubber
   c) Concrete
   d) Wood

7. Find the relationship between Young's modulus (E), bulk modulus (K), and Poisson's ratio (ν).
   a) $E = 3K(1-2\nu)$
   b) $E = K + \nu$
   c) $E = K - 2\nu$
   d) $E = 2K(1+\nu)$

8. Poisson's ratio is defined as the ratio of .....
   a) Longitudinal strain to lateral strain
   b) Lateral strain to longitudinal strain
   c) Shear stress to shear strain
   d) Longitudinal stress to lateral stress

9. What is the unit of resistance?
   a) Volt
   b) Ampere
   c) Ohm
   d) Farad

10. What is the formula for calculating current (I) in a simple resistor circuit using Ohm's Law?
    a) I=R/V
    b) I=V × R
    c) I=V2 × R
    d) I=V/R

11. Interpret series connection of resistors.
    a) Voltage across each resistor is same
    b) Total resistance is inverse sum
    c) Current divides among resistors
    d) Total resistance is sum of individual resistances

12. A 5 Ω resistor has 10 V across it. Calculate current.
    a) 12 A
    b) 0.5 A
    c) 5 A
    d) 2 A

13. In a P-type semiconductor, the holes can be considered as:
    a) Positive charge carriers.
    b) Negative charge carriers.
    c) Free electrons.
    d) Neutral particles.

14. Interpret reverse bias in a diode.
    a) Diode conducts freely
    b) Current increases
    c) Current is minimal
    d) Voltage drops to zero

15. Zener diode rated 5.1 V is reverse biased at 5.1 V. What occurs?
    a) Forward conduction
    b) No current flows
    c) Short circuit
    d) Controlled breakdown

16. What is the primary function of a Zener diode?
    a) To rectify AC signals.
    b) To limit the voltage across a load.
    c) To amplify signals.
    d) To block current in reverse bias.

17. What is the primary function of a printed circuit board (PCB)?
    a) To store electrical energy
    b) To support and connect electrical components
    c) To increase the voltage of circuits
    d) To provide insulation for electrical components

18. Which of the following tools is essential for the soldering process?
    a) Pliers
    b) Soldering iron
    c) Hammer
    d) Multimeter

19. Identify the tool used to join components on a PCB.
    a) Wire stripper
    b) Multimeter
    c) Soldering iron
    d) Pliers

20. A circuit experiences overload. Which device should be applied?
    a) Inductor
    b) Resistor
    c) Capacitor
    d) Fuse

PART – B

21. List any two examples of non-ferrous materials.
22. Define shear stress and shear strain.
23. Write the formula of Poisson's ratio.
24. State the uses of inductors.
25. State Ohm's law.
26. If three resistors of 4 Ω, 6 Ω, and 10 Ω are connected in series , calculate the total resistance.
27. Draw the symbol of PN Junction diode.
28. State the safety precautions to be taken to avoid electric shock.

PART – C

29. Write about any five mechanical properties of engineering materials.
30. A steel bar of 300mm long, 50mm wide and 10mm thickness is subjected to an axial pull of 150KN. Determine the changes in length, width, thickness, and volume of the bar. Assume E = 200kN/mm^2 and Poisson's ratio is 0.3.
31. Discuss the energy storage mechanism in capacitors and inductors.
32. Explain the construction and working of PN junction diode with sketch.
33. Explain the protective devices for electrical shock.
