

MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE (M.E.S.) UNDER PUBLIC HEALTH DEPARTMENT, GOVERNMENT OF MIZORAM, MAY, 2019.

ELECTRONICS & COMMUNICATION ENGINEERING PAPER - I

Time Allowed : 3 hours

FM : 200

SECTION - A (Multiple Choice questions)

(100 Marks)

All questions carry equal mark of 2 each. Attempt all questions.

This Section should be answered only on the OMR Response Sheet provided.

1. Which capacitor-store higher amount of energy?
 - (a) Air capacitor
 - (b) Paper capacitor
 - (c) Mica capacitor
 - (d) Plastic film capacitor
2. In paramagnetic materials -
 - (a) permanent magnetic dipoles exist but the interaction between neighbouring dipoles is negligible
 - (b) permanent magnetic dipole do not exist
 - (c) permanent magnetic dipoles exist and the interaction between neighbouring dipoles is very strong
 - (d) permanent magnetic dipole moment may or may not exist
3. Ferrites have -
 - (a) a low copper loss
 - (b) low eddy current loss
 - (c) low resistivity
 - (d) higher specific gravity compared to iron
4. At a very low temperature, a semiconductor -
 - (a) becomes a conductor
 - (b) becomes an insulator
 - (c) may become a conductor or an insulator
 - (d) will remain a semiconductor
5. The colour code on a carbon resistor is red-red-black-silver. The value of resistor is -
 - (a) 22000 Ω
 - (b) 2200 Ω
 - (c) 22 $\pm 5\% \Omega$
 - (d) 22 $\pm 10\% \Omega$
6. The temperature coefficient of a thermistor -
 - (a) is positive
 - (b) is negative
 - (c) zero
 - (d) may be positive or negative depending on its composition

7. Assertion (A) : Helium, Argon and Neon are gaseous at room temperature.

Reason (R) : The atoms in Helium, Argon and Neon are chemically extremely inactive.

- (a) Both A and R are true and R is correct explanation of A
- (b) Both A and R are true but R is not correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

8. Nichrome is used for -

- (a) overload line wires
- (b) heater coils
- (c) lamp filaments
- (d) all of these

9. If k is Boltzmann's constant and T is absolute temp, then at room temp

- (a) $kT \approx 0.025$ eV
- (b) $kT \approx 0.5$ eV
- (c) $kT \approx 1$ eV
- (d) $kT \approx 100$ eV

10. If the valence electron is separated from a copper atom, the remaining part of atom has a net charge of

- (a) 1
- (b) -1
- (c) 0
- (d) +3

11. Assertion (A) : Intrinsic resistivity of silicon is lower than that of germanium.

Reason (R) : Magnitude of free electron concentration in germanium is more than that of silicon

- (a) Both A and R are true and R is correct explanation of A
- (b) Both A and R are true but R is not correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

12. The units for ϵ_r are

- (a) Farads
- (b) Farads/m
- (c) $\frac{kV}{mn}$
- (d) no units

13. As the temperature of semiconductor is increased -

- (a) the average number of free charge carriers decreases
- (b) the average number of free charge carriers increases
- (c) the average number of free charge carriers remains the same
- (d) the average number of free charge carriers may increase or decrease

14. In the wave mechanical theory, the maximum of the charge distribution in the ground state occurs for a distance from the nucleus equal to

- (a) first Bohr radius
- (b) second Bohr radius
- (c) third Bohr radius
- (d) either first or second Bohr radius

15. Assertion (A) : Holes are majority carriers in p type semiconductor.

Reason (R) : In p type semiconductor, the electrons produced by thermal agitation recombine with holes.

- (a) Both A and R are true and R is correct explanation of A
- (b) Both A and R are true but R is not correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

16. Fleming's left hand rule is used to find -
(a) direction of force on a current carrying conductor
(b) direction of flux in solenoid
(c) direction of magnetic field due to a current carrying conductor
(d) direction of induced emf
17. The number of protons in a silicon atom are -
(a) 4 (b) 8
(c) 12 (d) 14
18. Assertion (A) : Hall effect is used to determine whether the semi-conductor is p or n type.
Reason (R) : Under the influence of field, holes and electrons move in opposite direction
(a) Both A and R are true and R is correct explanation of A
(b) Both A and R are true but R is not correct explanation of A
(c) A is true but R is false
(d) A is false but R is true
19. The most important set of specifications of transformer oil include -
(a) dielectric strength and viscosity (b) dielectric strength and flash point
(c) viscosity and flash point (d) flash point and viscosity
20. For isotopes of an element -
(a) They are atoms of the same atomic number with different mass
(b) The only difference in composition between isotopes of the same element is the number of neutrons in the nucleus
(c) The atomic weight of an element is an average of the weight of the isotopes of the element in the proportions in which they normally occur in nature
(d) All of these
21. N-type semiconductors are -
(a) Negatively charged
(b) Produced when indium is added as an impurity to germanium
(c) Produced when phosphorous is added as an impurity to silicon
(d) None of these
22. Which of the following gives piezo-electric effect -
(a) Mu metal (b) PVDF
(c) Sapphire (d) Ferrites
23. The type of systems which are characterized by input and the output quantized at certain levels are called as -
(a) analog (b) discrete
(c) continuous (d) digital
24. An example of a discrete set of information/system is -
(a) the trajectory of the Sun (b) data on a CD
(c) universe time scale (d) movement of water through a pip
25. A system which is linear is said to obey the rules of -
(a) scaling (b) additivity
(c) both scaling and additivity (d) homogeneity

26. A time invariant system is a system whose output -
(a) increases with a delay in input (b) decreases with a delay in input
(c) remains same with a delay in input (d) vanishes with a delay in input
27. A system is said to be defined as non-causal, when -
(a) the output at the present depends on the input at an earlier time
(b) the output at the present does not depend on the factor of time at all
(c) the output at the present depends on the input at the current time
(d) the output at the present depends on the input at a time instant in the future
28. A system produces zero output for one input and same gives the same output for several other inputs. What is the system called?
(a) Non – invertible System (b) Invertible system
(c) Non – causal system (d) Causal system
29. Which of the following signals are monotonic in nature?
(a) $1 - \exp(-t)$ (b) $1 - \exp(\sin(t))$
(c) $\log(\tan(t))$ (d) $\cos(t)$
30. For the signal $x(t) = a - b \cdot \exp(-ct)$, what is the steady state value, and the initial value?
(a) c, b (b) c, c-a
(c) a, a-b (d) b, a-b
31. Potential difference in electrical terminology is known as?
(a) Voltage (b) Current
(c) Resistance (d) Conductance
32. The circuit in which current has a complete path to flow is called _____ circuit.
(a) short (b) open
(c) closed (d) open loop
33. If the voltage-current characteristic is a straight line through the origin, then the element is said to be?
(a) Linear element (b) Non-linear element
(c) Unilateral element (d) Bilateral element
34. How many types of dependent or controlled sources are there?
(a) 1 (b) 2
(c) 3 (d) 4
35. If the resistances 1Ω , 2Ω , 3Ω , 4Ω are parallel, then the equivalent resistance is?
(a) 0.46Ω (b) 0.48Ω
(c) 0.5Ω (d) 0.52Ω
36. For a voltage source to be neglected, the terminals across the source should be -
(a) replaced by inductor (b) short circuited
(c) replaced by some resistance (d) open circuited
37. In case of ideal current sources, they have -
(a) zero internal resistance (b) low value of voltage
(c) large value of current (d) infinite internal resistance

38. A practical voltage source can also be represented as -
(a) a resistance in series with an ideal current source
(b) a resistance in series with an ideal voltage source
(c) a resistance in parallel with an ideal voltage source
(d) none of the mentioned
39. With some initial charge at $t = 0^+$, a capacitor will act as -
(a) open circuit (b) short circuit
(c) a current source (d) a voltage source
40. A voltage source of 300 V has internal resistance of 4Ω and supplies a load having the same resistance. The power absorbed by the load is -
(a) 1150 W (b) 1250 W
(c) 5625 W (d) 5000 W
41. In Superposition theorem, while considering a source, all other voltage sources are?
(a) open circuited (b) short circuited
(c) change its position (d) removed from the circuit
42. The maximum power is delivered from a source to its load when the load resistance is _____ the source resistance.
(a) greater than (b) less than
(c) equal to (d) less than or equal to
43. If source impedance is complex, then maximum power transfer occurs when the load impedance is _____ the source impedance.
(a) equal to (b) negative of
(c) complex conjugate of (d) negative of complex conjugate of
44. The dual pair of current is?
(a) voltage (b) current source
(c) capacitance (d) conductance
45. Tellegen's Theorem is valid for _____ network?
(a) linear or non-linear (b) passive or active
(c) time variant or time invariant (d) all of these
46. For Tellegen's Theorem to satisfy, the algebraic sum of the power delivered by the source is _____ than power absorbed by all elements.
(a) greater (b) less
(c) equal (d) greater than or equal
47. Reciprocity Theorem is used to find the change in _____ when the resistance is changed in the circuit.
(a) Voltage (b) Voltage or current
(c) Current (d) Power
48. Under normal conditions a diode conducts current when it is -
(a) reverse-biased (b) forward-biased
(c) Avalanched (d) Saturated

17. How is the loop analysis different in application/functioning level as compared to Kirchoff's law?
18. How is the short circuit reverse transfer admittance (y_{12}) calculated in terms of current and voltage ratio?
19. What will be the value of a rectangular (complete incidence) matrix, if an associated branch is oriented towards the node?
20. How is an insertion loss represented in terms of power ratio? Explain.

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