

MIZORAM PUBLIC SERVICE COMMISSION
DEPARTMENTAL EXAMINATION FOR JUNIOR GRADE OF M.E.S. (AE/SDO)
UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT,
GOVERNMENT OF MIZORAM.
(JULY, 2025)

ENGINEERING PAPER – II
ELECTRICAL ENGINEER

Time Allowed : 3 hours

FM : 100 PM : 40

SECTION - A (Multiple Choice questions) (50 Marks)

All questions carry equal mark of 1 each. Attempt all questions.

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

1. Which of the following is a ceramic material?
(a) Leather (b) MgO
(c) Invar (d) Nylon
2. The property of the material which enables it to resist abrasion is known as
(a) fatigue (b) creep
(c) hardness (d) plasticity
3. Galvanizing is the process of coating materials with a layer of
(a) aluminium (b) copper
(c) zinc (d) nickel
4. Copper becomes super conductive
(a) when 100% pure (b) when electro refined
(c) at very high temperatures (d) at absolute zero
5. The materials having permanent electric moments are called
(a) Antiferro-electric materials (b) Dielectrics
(c) Electrolytes (d) Semiconducting materials
6. Which of the following factor affects resistivity of metals?
(a) Age hardening (b) Alloying
(c) Temperatures (d) Cold works
7. An H.R.C fuse is
(a) A ceramic body having metal and caps (b) A wire of platinum
(c) A heavy cross-section of copper or aluminium (d) A ceramic tube having carbon rod inside
8. Superconductivity of materials can be destroyed by
(a) Application of magnetic field (b) Increasing temperature
(c) Reducing temperature (d) Adding impurities

9. "In a linear, bilateral network having more than one source, the current and voltage in any part of the network can be found by adding algebraically the effect of each source separately." The above statement is associated with
- (a) Superposition theorem
 - (b) Thevenin's theorem
 - (c) Norton's theorem
 - (d) Millman's theorem
10. "Any network with two open terminals **a** and **b** can be replaced by a single voltage source V_s in series with a single resistance R_s driving the **ab** terminals." The above statement is associated with
- (a) Superposition theorem
 - (b) Thevenin's theorem
 - (c) Norton's theorem
 - (d) Millman's theorem
11. "Any two terminal network can be replaced by a single current source I_N in parallel with a single resistance R_N ." The above statement is associated with
- (a) Superposition theorem
 - (b) Thevenin's theorem
 - (c) Norton's theorem
 - (d) Millman's theorem
12. "In a linear network containing bilateral impedances and generators, the ratio of voltage V introduced in one mesh to the current I in any second mesh is the same as the ratio obtained if the position of V and I are interchanged, other emf being removed." The above statement is associated with
- (a) Superposition theorem
 - (b) Thevenin's theorem
 - (c) Norton's theorem
 - (d) Millman's theorem
13. Kirchoff's law is applicable to
- (a) AC circuits only
 - (b) DC circuits only
 - (c) both AC and DC circuits
 - (d) passive networks only
14. Kirchoff's law is not applicable to circuits with
- (a) non-linear resistance
 - (b) passive elements
 - (c) distributed parameters
 - (d) lumped parameters
15. The algebraic sum of instantaneous phase voltages in a three-phase circuit is equal to
- (a) zero
 - (b) line voltage
 - (c) phase voltage
 - (d) phase current
16. If one line conductor of a 3-phase line is cut, the load is then supplied by
- (a) single phase voltage
 - (b) two phase voltage
 - (c) three phase voltage
 - (d) single and two phase voltages
17. Which resistance material is preferred for standards?
- (a) Manganin
 - (b) Platinum
 - (c) Nichrome
 - (d) German silver
18. The meter constant of a dial single phase energy meter is expressed in terms of
- (a) volts/kWh
 - (b) kW/kWh
 - (c) amps/kW
 - (d) revolutions/kWh
19. Which of the following instrument will always indicate true rms values irrespective of the waveform ?
- (a) Thermocouple meter
 - (b) Digital voltmeter
 - (c) Moving iron meter
 - (d) Electrostatic voltmeter
20. A power factor meter have
- (a) only current coil
 - (b) only voltage coil
 - (c) both current and voltage coil
 - (d) only inductive voltage coil

- 21.** An ammeter is
- (a) secondary instrument
 - (b) absolute instrument
 - (c) recording instrument
 - (d) integrating instrument
- 22.** The most commonly used induction type instrument is
- (a) induction voltmeter
 - (b) induction wattmeter
 - (c) induction watt-hour meter
 - (d) induction ammeter
- 23.** Out of the following, the most accurate measurement of unknown resistance will be by
- (a) potentiometer
 - (b) ohmmeter
 - (c) voltmeter and ammeter
 - (d) Wheatstone bridge
- 24.** Which of the following instrument is free from hysteresis and eddy current errors?
- (a) Moving iron instrument
 - (b) PMMC instrument
 - (c) Electrostatic instrument
 - (d) Dynamometer instrument
- 25.** What is the purpose of earthing
- (a) to maintain ground at zero potential
 - (b) to reduce the load current
 - (c) to protect the equipment from over load
 - (d) to reduce the losses
- 26.** What will happen to the value of earth resistance, if the length of the earth pipe is increased?
- (a) remain same
 - (b) increase
 - (c) decrease
 - (d) infinity
- 27.** Surge absorbers are used for protection against
- (a) High-voltage low-frequency oscillations
 - (b) High-voltage high-frequency oscillations
 - (c) Low-voltage high-frequency oscillations
 - (d) Low-voltage low-frequency oscillations
- 28.** In a power distribution system, where is a surge arrester typically installed for effective protection?
- (a) near the generator
 - (b) near the transformer
 - (c) near the load centre
 - (d) near the circuit breaker
- 29.** A lightning arrester is usually located nearer to
- (a) busbar
 - (b) transformer
 - (c) circuit breaker
 - (d) isolator
- 30.** Earthing of transformer neutral is usually done through reactance to
- (a) improve transient stability
 - (b) improve steady state stability
 - (c) improve transient as well as steady state stability
 - (d) reduce steady state stability
- 31.** Grounding wires are usually made of
- (a) stainless steel
 - (b) aluminium
 - (c) galvanised steel
 - (d) cast iron
- 32.** An electrical system is considered solidly earth
- (a) if it is directly connected to earth electrode
 - (b) if it connected to earth electrode through fuse wire
 - (c) if it connected to earth electrode through earth switch
 - (d) if it connected to earth electrode through circuit breaker

33. If power factor is 1 then the current and voltage across the load are
(a) out of phase (b) in phase
(c) 90° out of phase (d) 45° out of phase
34. If power factor is 0 then the current and voltage across the load are
(a) out of phase (b) in phase
(c) 90° out of phase (d) 45° out of phase
35. For reactive load, the power factor will be
(a) 0 (b) 1
(c) 2 (d) 3
36. Power factor is the ratio of
(a) average power/apparent power (b) apparent power/reactive power
(c) reactive power/ average power (d) apparent power/ average power
37. Power factor is the ratio of
(a) average power/apparent power (b) apparent power/reactive power
(c) reactive power/ average power (d) apparent power/ average power
38. The most economical power factor for a consumer is generally
(a) 0.95 lagging (b) 1
(c) 0.6 lagging (d) 0.75 lagging
39. When power factor is increased
(a) active power increases (b) active power decreases
(c) line current increases (d) line current decreases
40. Improving power factor means making it
(a) close to unity (b) zero
(c) less than 0.5 (d) more than 0.5
41. When power factor is improved, the lagging kVAR drawn from the supply will
(a) increase (b) decrease
(c) remain same (d) increase then decreases
42. Petroleum jelly is applied on the electrical connections to the lead acid battery to
(a) prevent short circuiting (b) prevent corrosion
(c) prevent local heating (d) reduce path resistance
43. A sulphated battery usually gives
(a) low ampere hour capacity (b) low voltage
(c) low specific gravity (d) all of the above
44. The energy is stored in a lead battery in the form of
(a) electromagnetic energy (b) electrostatic energy
(c) charged ions (d) chemical energy

45. If the specific gravity of electrolyte in a lead acid battery is 1.20, it can be concluded that
- (a) the battery has sulphated
 - (b) the battery is damaged and cannot be recharged
 - (c) the battery is half charged
 - (d) the battery is fully charged
46. The current conduction through the solution of an electrolyte is by
- (a) free electrons
 - (b) ions
 - (c) atoms
 - (d) valence electrons
47. The e.m.f of a cell does not depend upon
- (a) nature of electrolyte
 - (b) nature of material of electrolyte
 - (c) concentration of electrolyte
 - (d) size and spacing of electrodes
48. The most commonly used cell is
- (a) lead-acid cell
 - (b) nickle-iron cell
 - (c) nickle-cadmium cell
 - (d) fuel cell
49. When lead-acid cell is fully charged
- (a) anode is converted into Pb
 - (b) Cathode is converted into PbO_2
 - (c) Specific gravity of H_2SO_4 rises to about 1.28
 - (d) both plates becomes red
50. The life of the positive plates of a lead-acid cell is roughly _____ that of negative plates.
- (a) the same as
 - (b) half
 - (c) twice
 - (d) thrice

SECTION - B (Conventional Type) (50 Marks)

*This Section should be answered only on the **Answer Sheet** provided.*

Marks for each question is indicated against it.

1. What are the advantages of wound rotor motors over squirrel cage motors? (5)

2. Insulation resistance of 6.3MVA, 33/11kV transformer is measured between HV and Earth and the result obtained is shown below:

(a) 31.68 G' Ω after 10 minutes

(b) 16.50 G' Ω after 1 minutes

(c) 12.30 G' Ω after 15 seconds

Calculate the Polarization Index (PI) value and the Dielectric Absorption Ratio (DAR) value. (5)

3. Write down five advantages of vacuum circuit breakers. (5)

4. What are the factors upon which the choice of span in overhead transmission line depends? (5)

5. What are the advantages of oil over air as a cooling medium in transformer? (5)

6. What are the factors upon which the potential barrier of a **pn** junction depends? (5)

7. Mention the conditions to be met for paralleling Alternator with infinite busbar. (5)

8. The external PT ratio is 33000/110V and external CT ratio is 400/1A. If the energy meter is calibrated for PT ratio 33000/110V, CT ratio -/1A then what will be the multiplying factor for the meter? (5)

9. Briefly describe star-delta starting and mention its de-merits. (5)

10. What causes sulphation in lead-acid battery? How will you get rid of it? (5)

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