

MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATION FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM, (JULY-2025)

ENGINEERING PAPER – II

(Electricals/Electronics/Electrical & Electronics/Electronics & Communication/ Electronics & Telecommunication Engineers under Electrical Wing)

Time Allowed : 3 hours

FM : 100 PM : 40

PART - A (50-MARKS)

*This Section should be answered only on the **OMR Response Sheet** provided.
All questions carry equal marks of 1 each.*

1. Ampere-hour is the unit of -
(a) quantity of electricity (b) strength of current
(c) power (d) energy
2. In which of the following substances the resistance decreases with increase in temperature?
(a) carbon (b) constantan
(c) copper (d) silver
3. A length of wire has a resistance of 6 ohms. The resistance of a wire of the same material three times as long and twice the cross-sectional area will be
(a) 36 ohms (b) 9 ohms
(c) 1 ohm (d) 12 ohms
4. Electric current is a -
(a) scalar quantity (b) vector quantity
(c) sometimes scalar and sometimes vector (d) number only
5. An active element in a circuit is one which
(a) receives energy (b) supplies energy
(c) both receives and supplies energy (d) stores energy
6. The superposition theorem is used when the circuit contains
(a) a single voltage source (b) a number of voltage sources
(c) passive elements only (d) active elements only
7. The venin's theorem is _____ form of an equivalent circuit.
(a) voltage (b) current
(c) both voltage and current (d) resistance

8. Delta/Star or star/delta transformation technique is applied to -
- (a) one terminal network
 - (b) two terminal network
 - (c) three terminal network
 - (d) four terminal network
9. Nodal current analysis is based on-
- (a) Kirchoff's current law
 - (b) Kirchoff's voltage law
 - (c) Maxwell's law
 - (d) Millman's law
10. A kilowatt hour is the unit of -
- (a) energy
 - (b) power
 - (c) electric charge
 - (d) electric current
11. A generator produces 100 kW of power at a potential difference of 10 kV. The power is transmitted through cables of total resistance 5 ohms. What is power loss in the cables?
- (a) 1000 W
 - (b) 500 W
 - (c) 250 W
 - (d) 50 W
12. The power rating of a motor drawing a current of 40 A at 400 V is-
- (a) 16000 W
 - (b) 400 W
 - (c) 10 W
 - (d) 0.1 W
13. A 100 W bulb will give heat and light energy of-
- (a) 100 J/s
 - (b) 200 J/s
 - (c) 50 J/s
 - (d) 150 J/s
14. The current in a 960 W, 240 V heater operated at 200 V is-
- (a) 0.25 A
 - (b) 3/10 A
 - (c) 2.5 A
 - (d) 10/3 A
15. The most convenient way of achieving large capacitance is by using-
- (a) multiplate construction
 - (b) decrease distance between plates
 - (c) air as dielectric
 - (d) dielectric of low permittivity
16. Two capacitors of capacitances C_1 and C_2 are connected in parallel. A charge Q given to them is shared. The ratio of charges Q_1/Q_2 is-
- (a) C_2/C_1
 - (b) C_1/C_2
 - (c) $C_1 C_2/1$
 - (d) $1/C_1 C_2$
17. Two capacitors of capacitance $3 \mu\text{F}$ and $6 \mu\text{F}$ in series will have a total capacitance of-
- (a) $9 \mu\text{F}$
 - (b) $2 \mu\text{F}$
 - (c) $18 \mu\text{F}$
 - (d) $24 \mu\text{F}$
18. The unit of inductance is-
- (a) henry
 - (b) farad
 - (c) ohms
 - (d) micro farad
19. Inductive reactance is measured in ohms because it-
- (a) reduces the amplitude of alternating current
 - (b) increases the amplitude of alternating current
 - (c) increases the amplitude of direct current
 - (d) has a back emf opposing a steady direct current

20. The basic requirement for inducing e.m.f in a coil is that -
- (a) the flux should link the coil
 - (b) there should be change in flux linking the coil
 - (c) coil should form a closed loop
 - (d) coil should link the flux
21. The direction of induced e.m.f in a conductor (or coil) can be determined by-
- (a) work law
 - (b) Ampere's law
 - (c) Fleming's right hand rule
 - (d) Fleming's left hand rule
22. Inductance in a circuit-
- (a) prevents the current from changing
 - (b) delays the change in current
 - (c) causes power loss
 - (d) causes the current to lead the voltage
23. Mutual inductance between two coils is _____ reluctance of magnetic path.
- (a) directly proportional
 - (b) inversely proportional to
 - (c) independent of
 - (d) partially dependent of
24. When the number of turns in a coil is doubled without any change in the length of the coil, the self-inductance becomes -
- (a) double
 - (b) four times
 - (c) halved
 - (d) two times
25. The AC system is preferred to DC system because-
- (a) AC voltages can be easily changed in magnitude
 - (b) DC motors do not have fine speed control
 - (c) High-voltage AC transmission is less efficient
 - (d) DC voltages cannot be used for domestic appliances
26. We have assigned a frequency of 50Hz to power system because -
- (a) it can be easily obtained
 - (b) it gives best results when used for operating both lights and machinery
 - (c) it leads to easy calculations
 - (d) it is standardized
27. When 200 V sinusoidal peak-to-peak wave is connected across an AC voltmeter, it will read
- (a) 141.4 V
 - (b) 50 V
 - (c) 70.7 V
 - (d) 30.4 V
28. An alternating voltage or current is a-
- (a) scalar quantity
 - (b) vector quantity
 - (c) phasor
 - (d) scalar and vector quantity
29. In a pure resistive AC circuit, the frequency of power curve is _____ that of the circuit frequency
- (a) half
 - (b) twice
 - (c) thrice
 - (d) same as

30. In an R - L series circuit, the phase difference ϕ between applied voltage and circuit current will increase if-
- (a) X_L is increased
 - (b) R is increased
 - (c) X_L is decreased
 - (d) supply frequency is decreased
- Where X_L – Inductive reactance, R – Resistance
31. In an R - C series circuit, $X_C = R$. The phase angle between applied voltage and circuit current is-
- (a) 30°
 - (b) 45°
 - (c) 60°
 - (d) 90°
32. If in an R - L - C series circuit, the frequency is below the resonant frequency, then-
- (a) $X_C = X_L$
 - (b) $X_C < X_L$
 - (c) $X_C > X_L$
 - (d) $X_C < = X_L$
33. In a series R - L circuit supplied with 50 V, the circuit current is measured as 100 mA with a phase angle of 25° . What is the reactive power supplied to the circuit?
- (a) 4 VAR
 - (b) 2.1 VAR
 - (c) 3.2 VAR
 - (d) 7.8 VAR
34. A 60° lagging power factor implies that the load is-
- (a) inductive
 - (b) capacitive
 - (c) inductive or capacitive
 - (d) resistive
35. The phase sequence of a three-phase system is RYB . The other possible phase sequence can be-
- (a) BRY
 - (b) YRB
 - (c) RBV
 - (d) RYB
36. The advantage of star-connected supply system is that-
- (a) line current is equal to phase current
 - (b) two voltages can be used
 - (c) phase sequence can be easily changed
 - (d) it is a simple arrangement
37. If one line conductor of a three-phase line is cut, the load is then supplied by-
- (a) single phase
 - (b) two phase
 - (c) three phase
 - (d) line will trip
38. The resistance between any two terminals of a balanced delta-connected load is $12\ \Omega$. The resistance of each phase is-
- (a) $12\ \Omega$
 - (b) $18\ \Omega$
 - (c) $6\ \Omega$
 - (d) $36\ \Omega$
39. The most difficult unbalanced three-phase load to deal with is-
- (a) 4-wire star connected unbalanced load
 - (b) unbalanced delta-connected load
 - (c) unbalanced 3-wire, star-connected load
 - (d) unbalanced 2-wire, star-connected load
40. The stator of an alternator rarely uses _____ slots.
- (a) wide open type
 - (b) semi-closed type
 - (c) closed type
 - (d) semi-open type

- 41.** An alternator is sometimes called-
- (a) synchronous generator
 - (b) asynchronous generator
 - (c) Rosenberg
 - (d) synchronous motor
- 42.** The frequency of e.m.f generated in an 8-pole alternator running at 900 r.p.m is-
- (a) 50 Hz
 - (b) 60 Hz
 - (c) 120 Hz
 - (d) 80 Hz
- 43.** On an overhead line, the wind load acts
- (a) horizontally
 - (b) vertically downward
 - (c) vertically upward
 - (d) tangentially
- 44.** Corona effect
- (a) causes power loss in the line
 - (b) causes interference in radio communication
 - (c) produces radio frequency waves
 - (d) all of the above
- 45.** The capacitance of a transmission line is neglected in case of-
- (a) medium line
 - (b) long line
 - (c) short line
 - (d) extra long line
- 46.** The skin effect depends upon
- (a) temperature
 - (b) humidity
 - (c) frequency
 - (d) line span
- 47.** A zener diode is used as -
- (a) an amplifier
 - (b) a rectifier
 - (c) a voltage regulator
 - (d) a multivibrator
- 48.** The disadvantage of a half-wave rectifier is that the -
- (a) components are expensive
 - (b) diodes must have a high power rating
 - (c) output is difficult to filter
 - (d) transformer is required
- 49.** The most commonly used transistor arrangement is -
- (a) common emitter
 - (b) common base
 - (c) common collector
 - (d) Common base and collector
- 50.** Thyristor is basically
- (a) SCR
 - (b) Triac
 - (c) All PNP devices
 - (d) Both SCR and Triac

PART - B (50-MARKS)

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

Marks for each question is indicated against it.

Attempt all questions.

1. What are the differences between power transformers and distribution transformers? (5)
2. Explain direct and indirect lightning strike? Mention how transformer must be protected from lightning (5)
3. Insulation resistance of 6.3MVA, 33/11kV transformer is measured between HV and LV and the result obtained is shown below:
(a) 41.40 $\text{G}\Omega$ after 10 minutes
(b) 20.70 $\text{G}\Omega$ after 1 minutes
(c) 11.60 $\text{G}\Omega$ after 15 seconds
Calculate the Polarization Index (PI) value and the Dielectric Absorption Ratio (DAR) value? (5)
4. Briefly mention different methods of improving Earth Resistance? (5)
5. How are hydroelectric power stations divided on the basis of head of water? Mention the heads and type of turbines recommended? (5)
6. What are the main functions of Capacitive Voltage Transformer (CVT)? At what system voltage CVT is used? How is the HV terminals of CVT connected? (5)
7. The external PT ratio is 33000/110V and external CT ratio is 50/1A. 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)
8. What are the difference between Control & Relay (C&R) panels and switchgears? At what voltage level switchgear is commonly used in Mizoram? Mention in which sub-station 33kV Switchgear is used owned by Mizoram? (5)
9. How can we classify overhead transmission lines? Briefly describe how line constants are considered in each case? (5)
10. What are the standard span to be adopted for preparation of estimates/DPR for the following lines in case actual survey could not be done on time as per SOR 2023 prepared by P&E Department, Govt. of Mizoram? (5)
(a) LT Line (b) LT ABC
(c) 11kV Line (d) 33kV Line
(e) 33kV Lattice Tower Line

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