

194. Capacitive transducers can be used for measurement of liquid level. The principle of operation used in this case is
- (a) change of capacitance with change of distance between plates
 - (b) change of area plates
 - (c) change of dielectric strength
 - (d) none of the above
195. In a venturi meter the flow is $0.15 \text{ m}^3/\text{s}$ when the differential pressure is 30 KN/m^2 . The value of flow when the differential pressure is 60 KN/m^2 is
- (a) $0.212 \text{ m}^3/\text{s}$
 - (b) $0.106 \text{ m}^3/\text{s}$
 - (c) $0.3 \text{ m}^3/\text{s}$
 - (d) $0.075 \text{ m}^3/\text{s}$
196. F.M. systems as compared to A.M. systems
- (a) are equally effected by noise
 - (b) are less effected by noise
 - (c) are more effected by noise
 - (d) are highly effected by noise as they operate at VHF and UHF
197. A dynamometer type wattmeter responds to the
- (a) average value of active power
 - (b) average value of reactive power
 - (c) peak value of active power
 - (d) peak value of reactive power
198. A current measuring instrument can be used to measure voltage by
- (a) adding resistance in series
 - (b) adding resistance in parallel
 - (c) using larger wire in the coil
 - (d) using a high resistance shunt
199. Very small resistance can be measured more accurately by
- (a) resistance box
 - (b) Kelvin-double bridge
 - (c) Anderson bridge
 - (d) Schering bridge
200. Which instrument has the lowest resistance?
- (a) Ammeter
 - (b) Voltmeter
 - (c) Frequency meter
 - (d) Megger

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MIZORAM PUBLIC SERVICE COMMISSION
TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF
GRADE-V OF MIZORAM ENGINEERING SERVICE (AE/SDO)
UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM
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ELECTRICAL ENGINEERING
PAPER – I

Time Allowed : 3 hours

Full Marks : 200

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

1. Maxwell's divergence equation for the magnetic field is given by
 - (a) $\vec{\nabla} \times \vec{B} = 0$
 - (b) $\vec{\nabla} \cdot \vec{B} = 0$
 - (c) $\vec{\nabla} \times \vec{B} = \rho$
 - (d) $\vec{\nabla} \cdot \vec{B} = \rho$
2. The electric field lines and equipotential lines
 - (a) are parallel to each other
 - (b) are one and same
 - (c) cut each other orthogonally
 - (d) can be inclined to each other at any angle
3. A uniform plane wave travelling in a perfect dielectric is incident normally on the surface of a perfect conductor. Then
 - (a) the wave is transmitted into the conductor without attenuation
 - (b) 50% of the incident wave is transmitted and 50% is reflected
 - (c) a standing wave is set up in the conducting medium
 - (d) a standing wave is set up in the dielectric
4. With the increase in cross-sectional area of the conductor, the value of resistance
 - (a) increases
 - (b) remains same
 - (c) decreases
 - (d) none of these
5. The unit of magnetic field strength is
 - (a) ampere turns
 - (b) weber
 - (c) ampere per metre
 - (d) weber/metre²
6. Electromagnetic waves may be diffracted
 - (a) by reflection from the ground
 - (b) when encountered with a spherical wave front
 - (c) around the edge of a sharp obstacle
 - (d) while passing through a large slot
7. A wave travelling in x-direction has E_y and E_x components at 45° phase apart. The wave is
 - (a) linearly polarized
 - (b) elliptically polarized
 - (c) circularly polarized
 - (d) horizontally polarized

8. "In all cases of electromagnetic induction, an induced voltage will cause a current to flow in a closed circuit in such a direction that the magnetic field which is caused by the current will oppose the change that produces the current" is the original statement of
- (a) Lenz's law (b) Faraday's law of magnetic induction
(c) Fleming's law (d) Ampere's law
9. For a loss-less dielectric medium, the phase constant for a travelling wave, β is proportional to
- (a) ϵ_r (b) $\sqrt{\epsilon_r}$
(c) $1/\epsilon_r$ (d) $1/\sqrt{\epsilon_r}$
10. The velocity of a travelling electromagnetic wave in free space is given by
- (a) $\mu_0\epsilon_0$ (b) $\sqrt{\mu_0\epsilon_0}$
(c) $1/\mu_0\epsilon_0$ (d) $1/\sqrt{\mu_0\epsilon_0}$
11. Two electric dipoles aligned parallel to each other and having the same axis exert a force F on each other, when a distance d apart. If the dipoles are a distance $2d$ apart, then the mutual force between them would be
- (a) $F/2$ (b) $F/4$
(c) $F/8$ (d) $F/16$
12. When the plate area of a parallel plate capacitor is increased keeping the capacitor voltage constant, the force between the plates
- (a) increases
(b) decreases
(c) remains constant
(d) may increase or decrease depending on the metal
13. At a certain frequency, a uniform plane wave is found to have established a wavelength λ in a good conductor. If the source frequency is doubled, the wavelength would change to
- (a) $\lambda/\sqrt{2}$ (b) $\sqrt{2}\lambda$
(c) 2λ (d) 4λ
14. An air gap is usually inserted in magnetic circuits to
- (a) increase the flux (b) prevent saturation
(c) increase mmf (d) none of these
15. A capacitor of $40\ \mu\text{F}$ is charged to a potential difference of 500V . The energy stored in the electric field between the plates of this condenser is
- (a) 4.5 joules (b) 4 joules
(c) 5 joules (d) 40 joules
16. A loss-less transmission line with characteristic impedance of 600Ω is terminated in a purely resistive load of 900Ω . The reflection coefficient is
- (a) 0.2 (b) 0.5
(c) 0.667 (d) 1.5
17. The direction of the magnetic lines of force is
- (a) from positive to negative charges (b) from south to north poles
(c) from one end of the magnet to the other (d) from north pole to the south pole

183. If an energy meter disc makes 10 revolutions in 100 seconds when a load of 450W is connected to it, the meter constant (in rev/kwh) is
- (a) 100 (b) 500
(c) 1600 (d) 800
184. An n -bit AD converter using V as reference voltage has a resolution (in volts) of
- (a) $V_R/2^n$ (b) V_R/n
(c) $V_R/2^{n-1}$ (d) $V_R/2n$
185. Piezo-electric crystals are used for the measurement of
- (a) temperature (b) velocity
(c) sound (d) none of these
186. Which of the following transducers is used for transmitting as well as receiving the acoustic energy in an ultrasonic flow meter?
- (a) LVDT (b) RTD
(c) Piezo-electric crystals (d) Strain gauge
187. The capacitance and loss angle of a capacitor can be accurately measured by
- (a) Kelvin's bridge (b) Anderson's bridge
(c) Schering bridge (d) Carey-Foster bridge
188. A current transformer has a phase error of $+3^\circ$. The phase angle between the primary and secondary current is
- (a) 3° (b) 177°
(c) 180° (d) 183°
189. A differential transformer is a
- (a) variable inductance transducer (b) variable pressure transducer
(c) constant displacement transducer (d) constant pressure transducer
190. Hydrometer is used to determine
- (a) specific gravity of liquids (b) relative humidity
(c) specific gravity of solids (d) specific gravity of gases
191. Maxwell's inductance capacitance bridge is used for measurement of inductance of
- (a) low Q coils (b) medium Q coils
(c) high Q coils (d) low and medium Q coils
192. A Wheatstone bridge cannot be used for precision measurements because errors are introduced on account of
- (a) resistance of connecting leads (b) thermo-electric emfs
(c) contact resistance (d) all of the above
193. A PMMC meter has an internal resistance 200Ω and the current required for its full-scale deflection is $50\mu\text{A}$. The meter is capable of measuring, on its own, a maximum voltage of
- (a) 5mV (b) 10mV
(c) $5\mu\text{V}$ (d) $10\mu\text{V}$

173. In wire wound strain gauges, the change in resistance on application of strain is mainly due to
(a) change in length of wire (b) change in diameter of wire
(c) change in both length and diameter of wire (d) change in resistivity
174. Three types of transducers are compared as regards to their sensitivities. The order in which they exhibit sensitivities (highest to lowest) is
(a) thermistors, RTDs, thermocouples (b) thermocouples, RTDs, thermistors
(c) RTDS, thermistors, thermocouples (d) RTDs, thermocouples, thermistors
175. An inverse transducer converts
(a) electrical energy to any other form of energy
(b) electrical energy to light energy
(c) mechanical displacement into electrical signal
(d) electrical energy to mechanical form
176. Which one of the following is an active transducer?
(a) strain gauge (b) selsyn
(c) photovoltaic cell (d) photo emissive cell
177. The order of minimum displacement that can be measured with capacitive transducers is
(a) 1cm (b) 1mm
(c) 1 μ m (d) 1 $\times 10^{-12}$ m
178. Piezo-electric transducers are
(a) passive transducers (b) active transducer
(c) inverse transducers (d) both (b) and (c)
179. Capacitive transducers can be used for measurement of liquid level. The principle of operation used in this case is
(a) change of capacitance with change of distance between plates
(b) change of area of plates
(c) change of dielectric strength
(d) none of the above
180. A 5 bit D/A converter has a current output. The digital input is 10100 and the output current corresponding to this is 10mA. The output current for digital input of 11101 is
(a) 10.5 mA (b) 14.5 mA
(c) 29 mA (d) none of these
181. An A/D converter has a resolution of 20mV. The digital output for an analog input of 2.17V is
(a) 01101100 (b) 01101101
(c) 01101011 (d) none of these
182. For measuring low pressure of the range 10-2 mm of Hg, the apparatus used is
(a) strain gauge (b) Piezoelectric transducers
(c) Pirani gauge (d) ionization gauge

18. With the increase of temperature, insulating property of insulators
(a) weakens (b) strengthens
(c) remains same (d) none of these
19. When the load impedance is equal to the characteristic impedance of the transmission lines, then the reflection coefficient and standing wave ratio are respectively
(a) 0 and 0 (b) 1 and 0
(c) 0 and 1 (d) 1 and 1
20. Magnetic flux density at a point distance R due to an infinitely long linear conductor carrying a current I is given by
(a) $B = \frac{I}{2\pi R}$ (b) $B = \frac{\mu I}{2R}$
(c) $B = \frac{\mu I}{2\pi R}$ (d) $B = \frac{\mu I}{4\pi R}$
21. The characteristic impedance of an air dielectric co-axial line is 77Ω . If the air is replaced by a dielectric with $\epsilon_r=2.28$, then characteristic impedance will be
(a) 33.8Ω (b) 51Ω
(c) 116Ω (d) 175Ω
22. The electric potential due to an electric dipole of length L at point distance r away from it will be doubled if the
(a) L is doubled (b) r is doubled
(c) r is halved (d) L is halved
23. Two parallel wires separated by a distance d are carrying a current I in the same direction. The magnetic field along a line running parallel to these wires and midway between them
(a) depends upon I
(b) is zero
(c) depends upon d
(d) depends upon the permeability of the medium between the wires
24. A wave guide can be considered to be analogous to a
(a) low pass filter (b) high pass filter
(c) band pass filter (d) band stop filter
25. Inside a hollow conducting sphere
(a) electric field is zero
(b) electric field is a non-zero constant
(c) electric field changes with the magnitude of the charge applied to the conductor
(d) electric field changes with distance from the centre of the sphere
26. The electric circuit equivalent of flux in a magnetic circuit is
(a) load resistance (b) current
(c) voltage (d) conductivity

27. Two parallel conductors are carrying currents in the same direction. Which of the following statements is correct?
- (a) There is a repelling force between the conductors
 - (b) The force increases when the current is decreased
 - (c) There is an attracting force between the conductors
 - (d) The force increases when the distance between the conductors is increased
28. In a certain magnetic circuit, a current of one ampere in the winding produces a flux of 1 weber. If the reluctance of the magnetic circuit is doubled, then for producing the same flux, the current should be
- (a) 1 A
 - (b) $\frac{1}{2}$ A
 - (c) 2 A
 - (d) 4 A
29. A parallel plate capacitor has a capacitance of $10\mu\text{F}$. If the linear dimensions of the plates are doubled and the distance between them is also doubled; the new value of capacitance would be
- (a) $10\mu\text{F}$
 - (b) $20\mu\text{F}$
 - (c) $40\mu\text{F}$
 - (d) $5\mu\text{F}$
30. The relative permeability of a ferro-magnetic material is
- (a) 1
 - (b) less than 1
 - (c) more than 1000
 - (d) none of these
31. Silicon steel is used in the construction of electrical machines because it has
- (a) low hysteresis loss
 - (b) low retentivity
 - (c) low coercivity
 - (d) none of these
32. An e.m.f. induced in a coil due to a change in current in a neighbouring coil is known as
- (a) self-induced e.m.f.
 - (b) speed e.m.f.
 - (c) mutually induced e.m.f.
 - (d) none of these
33. The magnitude of statically induced e.m.f. depends on
- (a) the magnitude of flux
 - (b) the rate of change of flux
 - (c) the resistance of the coil
 - (d) none of these
34. The induced e.m.f. is maximum if the conductor cuts the magnetic field at
- (a) 0°
 - (b) 45°
 - (c) 90°
 - (d) none of these
35. An electromagnetic field is radiated from
- (a) a stationary point charge
 - (b) a capacitor with a DC voltage
 - (c) a conductor carrying a DC current
 - (d) an oscillating dipole
36. Relative permeability of vacuum is
- (a) $4\pi \times 10^{-7} \text{H/m}$
 - (b) 1 H/m
 - (c) 1
 - (d) $1/4\pi$

164. Phantom loading for testing of energy meters is used
- (a) to isolate the current and potential circuits
 - (b) to reduce power loss during testing
 - (c) for meters having low current ratings
 - (d) to test meters having a large current rating for which loads may not be available in the laboratory
165. Creeping in a single-phase induction type energy meter is due to
- (a) overcompensation for friction
 - (b) overvoltage
 - (c) vibrations
 - (d) all of the above
166. Creeping error in single-phase energy meter can be minimized by
- (a) adjusting the braking magnet
 - (b) using short circuited loops on the outer limbs of the shunt magnet
 - (c) drilling two holes in the disc on the opposite side of the spindle
 - (d) adjusting the shading band
167. In a reed type frequency meter, all the reeds
- (a) have the same natural frequency
 - (b) have different natural frequency
 - (c) have different natural frequency with a specific difference of the frequencies of adjacent reeds
 - (d) none of the above
168. Maxwell's inductance-capacitance bridge is used for measurement of inductance of
- (a) low Q coils
 - (b) medium Q coils
 - (c) high Q coils
 - (d) low and medium Q coils
169. The power consumption of a d.c. voltmeter using a direct coupling amplifier when measuring a voltage of 0.5V is of the order of
- (a) a few watt
 - (b) a few milliwatt
 - (c) a few microwatt
 - (d) a few nanowatt
170. Electronic voltmeters which use rectifiers employ negative feedback. This is done
- (a) to increase the overall gain
 - (b) to improve stability
 - (c) to overcome nonlinearity of diodes
 - (d) none of the above
171. In an electronic ohmmeter, an OP-AMP is used as a
- (a) summer
 - (b) multiplier
 - (c) buffer amplifier
 - (d) integrator
172. A transducer converts
- (a) mechanical energy into electrical energy
 - (b) mechanical displacement into electrical signal
 - (c) one form of energy into another form of energy
 - (d) electrical energy into mechanical form

154. Which of the following is not a transducer?
(a) microphone (b) strain gauge
(c) potentiometer (d) both (a) and (c)
155. LVDT is a
(a) displacement transducer (b) velocity transducer
(c) acceleration transducer (d) pressure transducer
156. A thermistor
(a) is made of semiconductor like silicon
(b) has positive temperature coefficient
(c) cannot be used for measuring temperature below 0°C
(d) has negative temperature coefficient
157. In a pH meter, which of the following measures the pH value?
(a) voltage difference between electrodes (b) temperature difference between electrodes
(c) pressure difference between electrodes (d) colour of electrodes
158. The principle of operation of LVDT is based on variation of
(a) self-inductance (b) mutual inductance
(c) reluctance (d) permeance
159. A 0-300V voltmeter has an error of $\pm 2\%$ of full scale deflection. What would be the range of readings if the true voltage is 30V?
(a) 24V - 36V (b) 29.4V - 30.6V
(c) 20V - 40V (d) none of these
160. A set of readings has a wide range, and therefore it has
(a) low precision (b) high precision
(c) low accuracy (d) high accuracy
161. The dimensions of resistance in CGS systems are
(a) $[\mu^{-1}LT^{-1}]$ (b) $[\mu^{-1}MLT^{-1}]$
(c) $[\mu LT^{-1}]$ (d) $[\mu LT^{-2}]$
162. The international standard of length is defined in terms of
(a) length of earth's meridian passing through Paris
(b) distance between two lines engraved on a platinum-iridium bar
(c) wavelength in vacuum, of radiation of Krypton-86 atom in its two specified transitions
(d) none of the above
163. The moving iron voltmeters indicate
(a) the same value for d.c. and a.c. voltages
(b) lower values for a.c. voltages than for corresponding d.c. voltages
(c) higher values for a.c. voltages than for corresponding d.c. voltages
(d) none of the above

37. The electrons in the atom of an element which determine its electrical and chemical properties are called
(a) valence electrons (b) excess electrons
(c) revolving electrons (d) active electrons
38. The maximum number of electrons in the outermost shell of an atom cannot exceed
(a) 18 (b) 8
(c) 32 (d) none of these
39. The maximum number of electrons in the shell preceding the valence shell cannot exceed
(a) 18 (b) 8
(c) 32 (d) none of these
40. Semiconductor materials have bonds
(a) ionic (b) covalent
(c) mutual (d) metallic
41. There is no hole current in good conductors because they
(a) are full of electron gas
(b) have large forbidden energy gap
(c) have no valence band
(d) have overlapping valence and conduction bands
42. Which of the following statements about insulators is not correct?
(a) they have full valence band
(b) they have an empty conduction band
(c) their valence electrons are very loosely bound to their parent atoms
(d) there is a large energy gap between the valence band and conduction band
43. Conduction electrons have more mobility than holes because they
(a) are lighter (b) experience collisions less frequently
(c) have negative charge (d) need less energy to move
44. Doping materials are called impurities because they
(a) decrease the number of charge carriers
(b) change the chemical properties of semiconductors
(c) make semiconductors less than 100 per cent pure
(d) alter the crystal structure of the semiconductor
45. Superconductors are popularly used for
(a) generating very strong magnetic fields
(b) reducing I^2R losses
(c) generating electrostatic field
(d) generating regions free from magnetic field
46. The temperature coefficient of an intrinsic semiconductor is
(a) zero (b) positive
(c) negative (d) same as that of metals

47. Hall's effect is used to measure
(a) electric field intensity (b) magnetic field intensity
(c) carrier concentration (d) none of these
48. The conductivity of a metal is determined by
(a) the total number of electrons per atom
(b) the number of valence electrons per atom
(c) the electronic concentration and the mobility of the free electrons
(d) all of these
49. Superconductivity in a material occurs at
(a) very high temperature (b) near absolute zero
(c) very low temperature (d) none of these
50. On introducing dielectric into a capacitor, which of the following quantity does not change?
(a) potential difference (b) electric field strength
(c) electric flux density (d) none of these
51. In a semiconductor the forbidden gap between valence band and conduction band is nearly
(a) 1 eV (b) 7 eV
(c) 10 eV (d) 100 eV
52. The emitter of a transistor is doped
(a) lightly (b) heavily
(c) not doped at all (d) may be doped heavily or lightly
53. Resistivity of electric conductors is most affected by
(a) temperature (b) pressure
(c) composition (d) none of these
54. Two coupled coils of $L_1 = 0.8\text{H}$ and $L_2 = 0.2\text{H}$ have a coupling coefficient of $K = 0.9$. The mutual inductance M is
(a) 0.144 H (b) 0.23 H
(c) 0.36 H (d) 0.43 H
55. The relative permeability of paramagnetic materials is
(a) very high (b) slightly more than one
(c) equal to one (d) less than one
56. A wave travelling in x-direction has E_x and E_y components 45° phase apart. The wave is
(a) linearly polarized (b) elliptically polarized
(c) circularly polarized (d) horizontally polarized
57. An example of piezoelectric material is
(a) Corundum (b) pure iron
(c) Germanium (d) Quartz

142. If there are b branches and n nodes, the number of KCL equations required will be
(a) b (b) n
(c) $(n-1)$ (d) $b-n+1$
143. The kWh meter is
(a) multimeter (b) Ammeter
(c) Wattmeter (d) energy meter
144. The damping force acts on the moving system of an indicating instrument only when it is
(a) moving (b) stationary
(c) near its full deflection (d) just starting to move
145. Megger is an instrument used to measure
(a) very low resistance (b) insulation resistance
(c) Q-factor of a coil (d) inductance of a coil
146. Which of the following instruments is equally accurate on D.C. as well as A.C.?
(a) Dynamometer wattmeter (b) moving iron ammeter
(c) PMCC voltmeter (d) induction wattmeter
147. The signal to be observed on the screen of a CRO is applied
(a) across its X-plates (b) across its Y-plates
(c) to the horizontal amplifier (d) to the trigger circuit
148. The operation of a Q-meter is based on
(a) self-induction (b) series resonance
(c) mutual induction (d) eddy currents
149. Which bridge is used to measure frequency?
(a) Anderson bridge (b) Wein bridge
(c) De Sauty's bridge (d) none of these
150. A 10mA ammeter with internal resistance of 90Ω is converted into an ammeter of 100mA. The shunt resistance used is
(a) 1Ω (b) 1.5Ω
(c) 10Ω (d) 15Ω
151. Moving iron instruments are used to measure
(a) direct current only (b) alternating current only
(c) both alternating and direct currents (d) none of these
152. In spring controlled instruments, the controlling torque is proportional to
(a) deflection θ (b) current I
(c) $\sin \theta$ (d) $\tan \theta$
153. A d.c. ammeter has a resistance of 0.1Ω , and its current range is 0-100A. If the range is to be extended to 0-500A, the meter requires the following shunt resistance
(a) 0.010Ω (b) 0.011Ω
(c) 0.025Ω (d) 1.0Ω

131. For a two-port network, Y_{22} is given by
(a) $Z_{11}/\Delta Y$ (b) $Z_{11}/\Delta Z$
(c) $Z_{22}/\Delta Y$ (d) $Z_{22}/\Delta Z$
132. In a series RLC circuit, the voltage across inductance will be maximum
(a) at resonant frequency (b) just after resonant frequency
(c) just before resonant frequency (d) just before and after resonant frequency
133. For a d.c. voltage, an inductor
(a) is virtually a short circuit (b) is virtually an open circuit
(c) depends on polarity (d) depends on voltage value
134. When phase sequence of a 3-phase load is reversed
(a) phase currents are changed in magnitude
(b) currents change in phase but not in magnitude
(c) total power consumed is changed
(d) phase powers are changed
135. A circuit component that opposes change in circuit current is
(a) resistance (b) capacitance
(c) inductance (d) conductance
136. Which of the following theorems is applicable to both linear and non-linear circuits?
(a) Super position (b) Thevenin's
(c) Norton's (d) None of these
137. Cells are connected in series in order to increase the
(a) current capacity (b) life of the cells
(c) voltage rating (d) terminal voltage
138. A wire of length l and of circular cross section of radius r has a resistance of R ohms. Another wire of the same material and of sectional radius $2r$ will have the same resistance R , if the length is
(a) $2l$ (b) $l/2$
(c) $4l$ (d) l^2
139. Two resistors R_1 and R_2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel, the resistances are
(a) 2Ω and 2.5Ω (b) 1Ω and 3.5Ω
(c) 1.5Ω and 3Ω (d) 4Ω and 0.5Ω
140. A circuit with a resistor, inductor and a capacitor in series is resonant at f_0 Hz. If all the component values are now doubled, the new resonant frequency is
(a) $2f_0$ (b) f_0
(c) $f_0/4$ (d) $f_0/2$
141. An inductor stores energy in
(a) electrostatic field (b) electromagnetic field
(c) magnetic field (d) core

58. Which of the following is a good conductor of both heat and electricity?
(a) metals (b) ceramics
(c) polymers (d) None of these
59. The standing wave ratio of a 75Ω transmission line used to feed a 300Ω resistance load will be
(a) 1 (b) 2
(c) 3 (d) 4
60. On which of the following factors does the value of critical current density in a superconductor depend?
(a) Temperature (b) Applied magnetic field
(c) Temperature and applied magnetic field (d) Silsbee's rule
61. Magnetic susceptibility of an ideal type 1 superconductor in the superconductivity state is
(a) infinity (b) -1
(c) between 0 and 1 (d) zero
62. Which of the following serves as a donor impurity in silicon?
(a) Boron (b) Indium
(c) Germanium (d) Antimony
63. If the lattice temperature is increased, then the Hall coefficient of a semiconductor will
(a) decrease (b) increase
(c) first increase to a peak then decrease (d) remain constant
64. In ceramic insulators, glazes are used to improve
(a) mechanical properties (b) chemical properties
(c) electrical properties (d) none of these
65. Which material is generally used for LED?
(a) Compounds of Silica (b) Compounds of gallium
(c) Compounds of Phosphorus (d) Compounds of Sulphur
66. The Hall coefficient of an intrinsic semiconductor is
(a) positive under all conditions (b) negative under all conditions
(c) zero under all conditions (d) dependent on the material
67. In Hall's effect, the output voltage produced across the crystal is due to
(a) movement of charge carriers towards one end
(b) induced voltage by the applied magnetic field
(c) voltage drop across the crystal due to flow of current through it
(d) none of the above
68. When the transition occurs to the superconducting state, the magnetic flux is excluded from the material. This is known as
(a) Magnetophobic effect (b) Silsbee effect
(c) Meissner effect (d) Cooper effect

69. What type of magnetic behaviour is observed in a type 1 superconductor?
(a) Perfect diamagnetism (b) Perfect paramagnetism
(c) Perfect ferromagnetism (d) Perfect ferrimagnetism
70. The conductivity of a metal at ultraviolet frequency (10¹⁴ Hz) approximately equals
(a) infinity (b) zero
(c) d.c. conductivity (d) half of d.c. conductivity
71. Forbidden band is largest in
(a) conductor (b) semiconductor
(c) insulator (d) reactor
72. The materials in which valence electrons are bounded very tightly to their parent atoms are called the
(a) ferrites (b) super conductors
(c) insulators (d) none of these
73. Piezoelectric effect is generally observed in
(a) insulators (b) insulators and semiconductors
(c) conductors and superconductors (d) conductors and semiconductors
74. In a conductor, the valence band and the conduction band
(a) are separated by a large gap (b) are separated by a small gap
(c) are overlapping (d) none of the above
75. In a semiconductor material doping is done to
(a) increase the number of charge carriers
(b) change the chemical properties of semiconductors
(c) make semiconductors less than 100% pure
(d) none of these
76. Which of the following is the best electrical conductor?
(a) Copper (b) Aluminium
(c) Silver (d) Cadmium copper
77. Iron is a
(a) ferromagnetic material (b) ferrimagnetic material
(c) paramagnetic material (d) anti-ferromagnetic material
78. High frequency transformer cores are generally made of
(a) cast iron (b) mu-metal
(c) ferrite (d) graphite
79. Which one of the following classes of materials can be categorized as ferrites?
(a) Plastics (b) Metals
(c) Alloys (d) Ceramics

120. Electrostatic effect is used in
(a) Ammeter (b) Voltmeter
(c) Wattmeter (d) Fluxmeter
121. During one time constant, current through an R-L circuit
(a) rises by 63% of its initial value (b) rises by 37% of its final steady value
(c) decays to 63% of its initial value (d) rises to 63% of its final steady value
122. A coil having R = 120Ω, and L = 24H is connected across a 12V battery. The current after 0.4 second will be
(a) 63mA (b) 100mA
(c) 86.3mA (d) none of these
123. A 10μF capacitor charged to 10V stores charges equal to
(a) 10μC (b) 100μC
(c) 200μC (d) 1μC
124. The parallel circuit resonance magnifies
(a) current (b) voltage
(c) both current and voltage (d) power
125. An alternator is delivering power to a balanced 3-phase load at unity power factor. The phase angle between the line voltage and the line current is
(a) 90° (b) 60°
(c) 30° (d) 0°
126. When a number of 2-port networks are connected in cascade, the individual
(a) Z_{oc} matrices are added (b) Y_{sc} matrices are added
(c) chain matrices are multiplied (d) H-matrices are multiplied
127. Superposition theorem is essentially based on the concept of
(a) duality (b) linearity
(c) reciprocity (d) non-linearity
128. The resonant frequency of a series resonant circuit is given by
(a) $f_0 = \sqrt{CR}$ (b) $f_0 = 2\pi\sqrt{LC}$
(c) $f_0 = \frac{1}{2\pi\sqrt{LC}}$ (d) $f_0 = \frac{2\pi}{\sqrt{LC}}$
129. In an R-L circuit with R = 100Ω and L = 0.2H and V = 5 volts, current will reach steady value after about milliseconds
(a) 2 (b) 10
(c) 20 (d) 5
130. A 3-phase, 3-wire supply feeds a load consisting of three equal resistors connected in star. If one of the resistors is open circuited, the percentage reduction in the load will be
(a) 75 (b) 50
(c) 66.66 (d) 33.33

110. Time period of a sinusoidal wave of frequency 50Hz is
(a) 0.1 sec (b) 0.01 sec
(c) 0.2 sec (d) 0.02 sec
111. When a phasor is multiplied by $-j$, it is rotated through in the counter clockwise direction
(a) 90° (b) 180°
(c) 270° (d) none of these
112. An a.c. series circuit consists of 200Ω resistance, 100Ω inductive reactance, and 100Ω capacitive reactance. Its power factor is
(a) 0.5 lagging (b) 0.5 leading
(c) zero (d) unity
113. In a circuit having a resistance and a reactance, and a power factor angle ϕ , the power absorbed by the circuit is maximum, when ϕ is equal to
(a) 90° (b) 45°
(c) 0° (d) none of these
114. In a balanced 3-phase star connected system, the angle between V_{RB} and V_R is
(a) 90° (b) 120°
(c) 60° (d) 30°
115. In a series circuit the impedance below resonant frequency is
(a) capacitive
(b) inductive
(c) resistive
(d) depends upon the values of circuit components
116. A star-connected balanced load draws a line current of 10A from a balanced three-phase four-wire star-connected system. The current flowing in the neutral wire is equal to
(a) 30A (b) $\sqrt{3} \times 10A$
(c) $\sqrt{2} \times 10A$ (d) 0A
117. Kirchoff's laws are applicable to
(a) D.C. only (b) A.C. only
(c) both A.C. and D.C. (d) none of these
118. The number of loop equations in an electrical circuit with 10 branches and 7 nodes is
(a) 10 (b) 4
(c) 3 (d) 7
119. While Thevenizing a circuit between two terminals, V_{th} equals
(a) short-circuit terminal voltage
(b) open-circuit terminal voltage
(c) EMF of the battery nearest to the terminals
(d) net voltage available in the circuit

80. Ferromagnetic materials when heated to temperature above Curie temperature
(a) behave as paramagnetic materials (b) become ferrites
(c) tend towards superconductivity (d) become insulators for heat and electricity
81. The resistance of a reverse biased ideal diode is
(a) zero (b) low
(c) negative (d) infinity
82. Ferrites are sub-group of
(a) ferromagnetic material (b) ferrimagnetic material
(c) diamagnetic material (d) paramagnetic material
83. The conductivity of a pure semi-conductor
(a) is proportional to temperature
(b) increases exponentially with temperature
(c) decreases exponentially with increasing temperature
(d) none of these
84. An active element in a circuit is one which
(a) receives energy (b) supplies energy
(c) both receives and supplies energy (d) none of these
85. A passive element in a circuit is one which
(a) receives energy (b) supplies energy
(c) both receives and supplies energy (d) none of these
86. Power factor of a resonant circuit is
(a) 1
(b) 0
(c) infinite
(d) depends on the values of the circuit parameters
87. Superposition theorem can be applied only to circuits having elements
(a) non-linear (b) passive
(c) linear bilateral (d) resistive
88. Transient disturbance is produced in a circuit whenever
(a) it is suddenly connected or disconnected from the supply
(b) it is shorted
(c) its applied voltage is changed suddenly
(d) all of the above
89. Transient currents in electrical circuits are associated with
(a) inductors (b) capacitors
(c) resistors (d) both (a) and (b)

90. In an R-L circuit connected to an alternating sinusoidal voltage, size of transient current primarily depends on
(a) the instant in the voltage cycle at which circuit is closed
(b) the peak-value of steady-state current
(c) the circuit impedance
(d) the supply frequency
91. Three identical resistances connected in star consume 4000W. If the resistances are connected in delta across the same supply, the power consumed will be
(a) 4000W (b) 6000W
(c) 12000W (d) $\sqrt{3} \times 4000W$
92. If positive phase sequence of a 3-phase load is abc, the negative sequence would be
(a) bac (b) cba
(c) acb (d) all of these
93. Q-factor of a coil is the measure of its
(a) mutual inductance (b) self inductance
(c) retentivity (d) selectivity
94. \sqrt{LC} has the dimension of
(a) second (b) rad/sec
(c) sec/rad (d) none of these
95. Current flowing in a series circuit having four equal resistances is I amperes. What is the magnitude of the current if the four resistances are connected in parallel?
(a) $0.25 I$ amperes (b) I amperes
(c) $4 I$ amperes (d) none of these
96. Two resistors of 4Ω and 12Ω are connected in parallel, and the combination is connected in series with a 2Ω resistor. If the circuit is connected across a 100V supply, the total current drawn is
(a) 50A (b) 25A
(c) 20A (d) 2A
97. Two capacitors of capacitance $32\mu F$ each are connected in a parallel with a third capacitor of $64\mu F$ in series. The resultant capacitance is
(a) $32\mu F$ (b) $64\mu F$
(c) $96\mu F$ (d) $48\mu F$
98. Under the condition of maximum power transfer, the efficiency is
(a) 50% (b) 100%
(c) 25% (d) depends on the values of resistances
99. The current in an RLC series circuit at resonance is
(a) maximum (b) minimum
(c) infinity (d) zero

100. For a two-port symmetrical bilateral network, if $A = 3$ and $B=1\Omega$, the value of parameter C will be
(a) 4s (b) 6s
(c) 8s (d) 16s
101. In r-c series circuit excited by a d.c. source, the circuit current is maximum at
(a) $t = 0^-$ (b) $t = 0^+$
(c) $t = \text{infinity}$ (d) $t = CR$
102. In deriving the equivalent resistance at any pair of terminals of a network with the help of Thevenin's theorem
(a) all independent voltage sources are open-circuited
(b) all independent current sources are short circuited
(c) the internal resistance of all independent sources is neglected
(d) none of these
103. Nodal Analysis concept is based on
(a) Ohm's law (b) Reciprocity theorem
(c) Kirchoff's current and voltage laws (d) superposition theorem
104. Three resistances of 3Ω each are connected in delta. The value of the resistances in the equivalent star is
(a) 27Ω (b) 9Ω
(c) 1.5Ω (d) 1Ω
105. The Norton equivalent of a circuit consists of a 2A current source in parallel with a 4Ω resistor. Thevenin's equivalent of this circuit is avolt source in series with a 4Ω resistor.
(a) 2 (b) 0.5
(c) 6 (d) 8
106. An a.c. current is given by $i = 14.14 \sin(\omega t + \pi/6)$. Its rms value is
(a) 10A (b) 14.14A
(c) 1.96A (d) 7.07A
107. Two sinusoidal currents are given by $i_1 = 10 \sin(\omega t + \pi/3)$ and $i_2 = 15 \sin(\omega t - \pi/4)$. The phase difference between them is
(a) 105 degrees (b) 75 degrees
(c) 15 degrees (d) 60 degrees
108. An a.c. current is given by $i = 100 \sin 100\pi t$. It will achieve a value of 50A after
(a) $1/600$ seconds (b) $1/300$ seconds
(c) $1/1800$ seconds (d) $1/900$ seconds
109. In a series RLC circuit with $R = 100\Omega$, $X_L = 25\Omega$ and $X_C = 35\Omega$ the current flowing is 5A, the power dissipated is
(a) $250 \sqrt{2}W$ (b) 50W
(c) 100W (d) 2500W