

1. The minimum pass band magnitude of the Butterworth filter is
- (A) $\frac{1}{1+\epsilon^2}$ (B) $\frac{1}{A^2}$
- (C) $\frac{1}{\sqrt{1-\epsilon^2}}$ (D) $\sqrt{1-\epsilon^2}$
- (E) Answer not known
2. In the type I Chebyshev filters, the magnitude characteristic is
- (A) Monotonic in the pass band
- (B) Equiripple in the stop band
- (C) Equiripple in the pass band
- (D) Squared in the stop band
- (E) Answer not known
3. The continuous time signal $x(t) = \sin 50\pi t$, then fundamental period is
- (A) 25 sec (B) $\frac{1}{25}$ sec
- (C) 50 sec (D) $\frac{1}{50}$ sec
- (E) Answer not known

4. An important feature of linear modulation schemes is that the
- (A) Carrier merely translates the message signal
 - (B) Carrier completely different from message signal
 - (C) Carrier merely receives the message signal
 - (D) No change in the carrier signal
 - (E) Answer not known
5. The digital tone detection can easily be performed by computing _____ of the DTMF signal
- (A) FFT
 - (B) ZFT
 - (C) IDFT
 - (D) DFT
 - (E) Answer not known
6. Write an ALP, such that the final contents of the accumulator are FF, without using any immediate addressing mode instruction
- (A) MVI A, FF
 - (B) XRA A
DCR M
 - (C) XRA A
INR A
 - (D) XRA A
DCR A
 - (E) Answer not known

7. The number of counters and the number of bits in each counter in 8253 programmable timer are
- (A) 3 and 16 bit counters (B) 3 and 8 bit counters
(C) 4 and 16 bit counters (D) 4 and 8 bit counters
(E) Answer not known
8. Basic steps of execution of an instruction is
- (A) fetch, execute, decode
(B) decode, fetch, execute
(C) execute, fetch, decode
(D) fetch, decode, execute
(E) Answer not known
9. The instruction set of 8085 can be divided into — functional group
- (A) 2 (B) 4
(C) 8 (D) 3
(E) Answer not known
10. The 8257 Enables a designer to interface maximum of — IO devices
- (A) 8
(B) 4
(C) 16
(D) 2
(E) Answer not known

11. A Translay scheme is similar to ————— balance system
- (A) Current (B) Voltage
(C) Distance (D) Differential
(E) Answer not known
12. In a 220 kV system, the inductance and capacitance upto the circuit breaker location are 25 mH and $0.025 \mu F$ respectively. The value of resistor required to be connected across the breaker contacts to give no transient oscillations is
- (A) 25 Ω (B) 250 Ω
(C) 500 Ω (D) 1000 Ω
(E) Answer not known
13. A salient pole alternator without dampers is rated 20 MVA, 13.8 KV and has $X_d'' = j 0.25$ pu; The negative and zero sequence reactances are $j 0.35$, $j 0.1$ p.u respectively. The neutral of generator is solidly grounded. Determine symmetrical current components I_{a0}, I_{a1}, I_{a2} for LG and LL faults in per unit
- (A) LG : 0, $-j 1.43$, $+j 1.43$; LL : 0, $-j 1.667$, $+j 1.667$
(B) LG : 0, 0, $+j 1.43$; LL : 0, $+j 1.667$, 0
(C) LG : $-j 1.43$, $-j 1.43$, $-j 1.43$; LL : 0, $-j 1.667$, $+j 1.667$
(D) LG : $-j 1.43$, 0, $+j 1.43$; LL : 0, $-j 1.667$, $+j 1.667$
(E) Answer not known

14. The three phase SC MVA to be interrupted by a circuit breaker in a power system is given by
- (A) $\sqrt{3} \times \text{post fault line voltage in kV} \times \text{SC current in kA}$
 - (B) $3 \times \text{pre fault line voltage in kV} \times \text{SC current in kA}$
 - (C) $\sqrt{3} \times \text{pre fault line voltage in kV} \times \text{SC current in kA}$
 - (D) $\frac{1}{\sqrt{3}} \times \text{pre fault line voltage in kV} \times \text{SC current in kA}$
 - (E) Answer not known
15. In Gauss-Seidel method of power flow problem, the number of iteration may be reduced if the correction in voltage at each BUS is multiplied by
- (A) Gauss constant
 - (B) Blocking factor
 - (C) Deacceleration factor
 - (D) Acceleration factor
 - (E) Answer not known
16. If a combination of HRC fuse and circuit breaker is used, the C.B. operates for
- (A) Low over load currents
 - (B) Short circuit currents
 - (C) Under all abnormal currents
 - (D) The combination is never used in practice
 - (E) Answer not known

17. _____ is the phenomenon of current interruption before the natural current zero is reached
- (A) RRRV
 - (B) Capacitive Current breaking
 - (C) Current chopping
 - (D) Resistance switching
 - (E) Answer not known
18. The maximum power that can be transmitted without loss of stability is
- (A) $P_{\max} = \frac{|E||V|}{X} \sin \delta$
 - (B) $P_{\max} = \frac{|E||V|}{X} \cos \delta$
 - (C) $P_{\max} = \frac{|E||V|}{X}$
 - (D) $P_{\max} = \frac{|E||V|}{X} \sin 30^\circ$
 - (E) Answer not known
19. In bus bar protection, what is the method of providing an earthed metal barrier surrounding a bus bar throughout its entire length called?
- (A) Distance protection
 - (B) Time graded over current protection
 - (C) Fault bus protection
 - (D) Differential protection
 - (E) Answer not known

20. In a system of 132 kV, the line to ground capacitance is $0.01 \mu\text{F}$ and the inductance is 5H . Determine the resistance to be used across the contacts to eliminate the restriking voltage.
- (A) $16.29 \text{ k}\Omega$
 - (B) $8.92 \text{ k}\Omega$
 - (C) $11.18 \text{ k}\Omega$
 - (D) $18.77 \text{ k}\Omega$
 - (E) Answer not known
21. In load flow studies, the load bus is denoted as
- (A) A voltage dependent impedance at bus
 - (B) Constant voltage and real power
 - (C) Constant real and reactive powers
 - (D) Constant voltage and reactive power
 - (E) Answer not known
22. In a differential relay, the restraining coil current is
- (A) The current in the operating coil
 - (B) The current flowing into the protected zone
 - (C) The difference between the current entering and leaving the protected zone
 - (D) The current in the primary winding of the CT
 - (E) Answer not known

23. Identify an over current relay with directional resistant from the following
- (A) Impedance relay
 - (B) Mho relay
 - (C) Reactance relay
 - (D) Over current relay
 - (E) Answer not known
24. Identify the option that does not contribute to the improvement of steady state stability
- (A) Increasing the system voltage
 - (B) Decreasing the generator inertia
 - (C) Reducing the transfer reactance
 - (D) Using a series capacitor in the transmission lines
 - (E) Answer not known
25. The type of circuit breaker is commonly used for high voltage and high power applications.
- (A) Miniature Circuit Breaker (MCB)
 - (B) Air Circuit Breaker (ACB)
 - (C) Vaccum Circuit Breaker (VCB)
 - (D) SF6 Circuit Breaker
 - (E) Answer not known

26. The high frequency vibrations in the overhead transmission lines are greatly diminished by
- (A) Galloping rods
 - (B) Stock bridge damper
 - (C) Varney damper
 - (D) High inertia clamps
 - (E) Answer not known
27. Economisers are used to heat
- (A) Air
 - (B) Feed water
 - (C) Steam
 - (D) Fuel
 - (E) Answer not known
28. The surge impedance of 50 miles long under ground cable is 50 ohms. For a 100 mile length of same cable, surge impedance will be
- (A) 25 ohms
 - (B) 100 ohms
 - (C) 50 ohms
 - (D) 0 ohms
 - (E) Answer not known

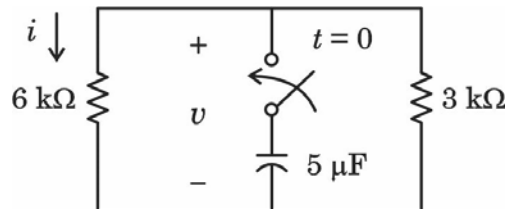
29. Which of the following facts compensator would not provide series compensation?
- (A) Static Synchronous Series Compensator (SSSC)
 - (B) Interline Power Flow Controller (IPFC)
 - (C) Unified Power Flow Controller (UPFC)
 - (D) Static Compensator (STATCOM)
 - (E) Answer not known
30. The load factors of nuclear power plants ranges from
- (A) 20 to 30%
 - (B) 40 to 50%
 - (C) 65 to 75%
 - (D) 80 to 90%
 - (E) Answer not known
31. A small generating plant of 1 MW capacity uses gas of calorific value of 4000 kJ/m^3 . If the overall efficiency of plant is 40%, the volume of gas required per hour while the plant is running at full load condition
- (A) $3,000 \text{ m}^3/\text{hr}$
 - (B) $2,250 \text{ m}^3/\text{hr}$
 - (C) $1,250 \text{ m}^3/\text{hr}$
 - (D) $1,000 \text{ m}^3/\text{hr}$
 - (E) Answer not known

32. A single circuit 50 Hz, 3-phase transmission line has $R = 0.2 \text{ ohm/km}$, $L = 1.3 \text{ mH/km}$ and $c = 0.01 \text{ }\mu\text{F/km}$. The voltage at the receiving end is 132 kV. If the line is open at the receiving end, the incident voltage to neutral at the receiving end (reference) would be
- (A) 19,050 volts
 - (B) 25,400 volts
 - (C) 38,100 volts
 - (D) 76,200 volts
 - (E) Answer not known
33. A cable has an inductance of 0.22 mH per km and capacitance of 0.202 μF per km. The surge impedance of the cable is
- (A) 28 Ω
 - (B) 33 Ω
 - (C) 42 Ω
 - (D) 50 Ω
 - (E) Answer not known
34. Which of the following methods help in reducing the corona effect?
- (A) Increasing conductor size
 - (B) Increasing conductor spacing
 - (C) Decreasing conductor size
 - (D) Both (A) and (B)
 - (E) Answer not known

35. Pumped storage plants are mostly used as
- (A) High head plant
 - (B) Run off river plant
 - (C) Peak load plant
 - (D) Base load plant
 - (E) Answer not known
36. A Transmission line between two level conductor has cross-sectional area of 2 cm^2 calculate the tension experienced by the line with a safety factor of 4. If the breaking stress is 4000 kg/cm^2
- (A) 4000 kg
 - (B) 2000 kg
 - (C) 1600 kg
 - (D) 8000 kg
 - (E) Answer not known
37. The per unit impedance of a line is X P.U. If the base voltage is tripled and base MVA is doubled, the new per unit impedance is
- (A) X
 - (B) $\frac{1}{9} X$
 - (C) $\frac{2}{9} X$
 - (D) $9X$
 - (E) Answer not known
38. Shunt compensation in an EHV line is used to improve
- (A) Stability and fault level
 - (B) Fault level
 - (C) Voltage profile and stability
 - (D) Stability
 - (E) Answer not known

39. A 3ϕ transmission line conductors were arranged in horizontal spacing with 'd' as the distance between adjacent conductors. If these conductors are rearranged to form an equilateral triangle with sides equal to 'd', then the
- (A) Capacitance and inductance will increase
 - (B) Capacitance increases and inductance decreases
 - (C) Capacitance and inductance remains same
 - (D) Capacitance decreases, inductance increases
 - (E) Answer not known
40. A stringing chart is useful for
- (A) Finding the sag in the conductor
 - (B) Designing of tower
 - (C) Designing of Insulator ring
 - (D) Finding the distance between towers
 - (E) Answer not known
41. Determine the average power delivered to the networks having the Input voltage and current of
- $$v = 100 \sin(\omega t + 40^\circ)$$
- $$i = 20 \sin(\omega t + 70^\circ)$$
- (A) $500\sqrt{3} w$
 - (B) $1000\sqrt{3} w$
 - (C) $2000 w$
 - (D) $2000\sqrt{3} w$
 - (E) Answer not known

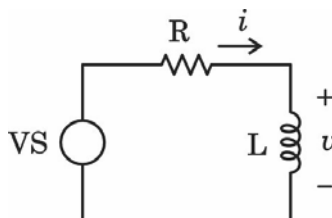
42. If a load is purely resistive and the true power is 5w, what is the apparent power?
- (A) 10 VA (B) 20 VA
(C) 50 VA (D) 5 VA
(E) Answer not known
43. A $5\mu\text{f}$ capacitor with an initial voltage of 4V is connected to a parallel combination of $3\text{ k}\Omega$ and $6\text{ k}\Omega$ resistor. The expression for current in $6\text{ k}\Omega$ resistor after the switch is closed at $t = 0$.



- (A) $6e^{-100t} \text{ mA}$ (B) $0.125 e^{-100t} \text{ mA}$
(C) $4 e^{-100t} \text{ mA}$ (D) $0.67 e^{-100t} \text{ mA}$
(E) Answer not known
44. In a star-connected three-phase system, the relation between the line and phase values are
- (A) $V_L = V, I_L = \sqrt{3} I$ (B) $V_L = \sqrt{3} V, I_L = I$
(C) $V_L = \frac{V}{\sqrt{3}}, I_L = I$ (D) $V_L = V, I_L = \frac{I}{\sqrt{3}}$
(E) Answer not known

45. A series R-L-C circuit having $R = 5\Omega$, $L = 400\text{ H}$ and $C = 4\text{F}$ is fed from a $400\angle 0^\circ$ volt supply. Then the voltage across the capacitor at resonance will be
- (A) 800 V (B) 1000 V
(C) 400 V (D) 200 V
(E) Answer not known

46. Identify the unit step response of series RL circuit.



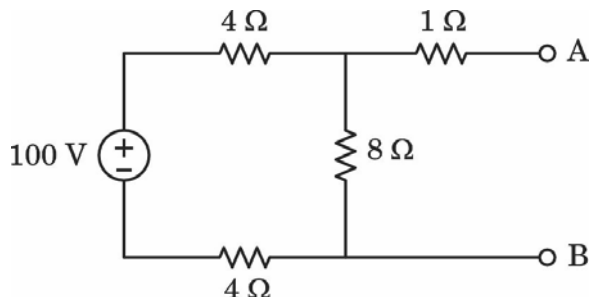
- (A) $v = e^{-\frac{R}{L}t} u(t)$, $i = \left(\frac{1}{R}\right) \left(1 - e^{-\frac{R}{L}t}\right) u(t)$
- (B) $v = \left(1 - e^{-\frac{R}{L}t}\right) u(t)$; $i = \frac{1}{R} \left(e^{-\frac{R}{L}t}\right) u(t)$
- (C) $v = e^{-\frac{L}{R}t} u(t)$; $i = \frac{1}{R} \left(1 - e^{\frac{L}{R}t}\right) u(t)$
- (D) $v = -e^{-\frac{R}{L}t} u(t)$; $i = \frac{1}{R} \left(1 + e^{-\frac{R}{L}t}\right) u(t)$
- (E) Answer not known

47. The y -parameters of a 2-port network are given by $[y] = \begin{vmatrix} 4 & -4 \\ 4 & -3 \end{vmatrix}$
- (A) The network is symmetrical and reciprocal
 - (B) The network is non-symmetrical and reciprocal
 - (C) The network is symmetrical and non-reciprocal
 - (D) The network is non-symmetrical and non-reciprocal
 - (E) Answer not known
48. A $230/2300\text{ V}$, $Star/Delta$, 3 phase transformer is rated at 230 kVA, its rated secondary Current/Phase is
- (A) 11.11 A
 - (B) 66.66
 - (C) 33.33
 - (D) 133.33
 - (E) Answer not known
49. In a parallel RLC circuit, the behavior of the total current under resonance condition will be
- (A) Minimum
 - (B) Increases
 - (C) Decreases
 - (D) Remains constant
 - (E) Answer not known
50. Total instantaneous power supplied by three phase AC supply to a balanced R-L load is
- (A) Zero
 - (B) Constant
 - (C) Pulsating with zero average
 - (D) Three times of real power
 - (E) Answer not known

51. In series RLC circuit, the condition for critically damped response is
- (A) $\frac{R}{2L} = \frac{1}{LC}$ (B) $\frac{R}{2L} = \frac{L}{C}$
- (C) $\frac{R}{2L} = \left[\frac{1}{LC} \right]^2$ (D) $\left[\frac{R}{2L} \right]^2 = \frac{1}{LC}$
- (E) Answer not known
52. Calculate the active (or) real power consumed by a electric load if the total power is 400 VA with 0.5 power factor
- (A) 400 W (B) 300 W
- (C) 200 W (D) 500 W
- (E) Answer not known
53. The Thevenin equivalent of a network is a _____ with an independent voltage source.
- (A) Resistor in parallel (B) $R = 0$
- (C) Resistor in series (D) $R = \infty$
- (E) Answer not known
54. The ratio of maximum value to the effective value of an alternating quantity is called
- (A) Dynamic factor
- (B) Form factor
- (C) Leakage factor
- (D) Peak factor
- (E) Answer not known

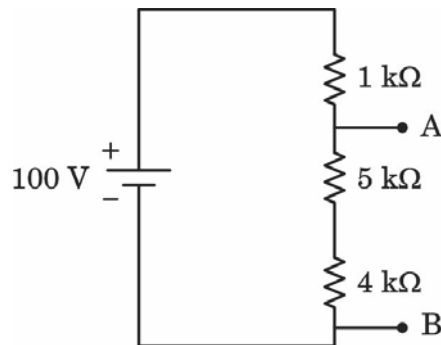
55. A total current of 10 A flows into a circuit consisting of 2 Ω , 4 Ω , 10 Ω and 20 Ω resistance connected in parallel. The current in each resistances 2 Ω , 4 Ω , 10 Ω and 20 Ω are _____ respectively.
- (A) 5.5 A, 2.8 A, 1.1 A, 0.55 A
 - (B) 2.8 A 1.1A 0.55 A 5.5 A
 - (C) 1.1 A 0.55A 5.5A 2.8 A
 - (D) 0.55 A 5.5A 2.8A 1.1A
 - (E) Answer not known
56. Super node is considered in nodal analysis, when there is a _____ between two nodes.
- (A) Dependent current source
 - (B) Voltage source
 - (C) Independent current source
 - (D) Impedance
 - (E) Answer not known

57. Find the value of resistance to be connected at A – B so that maximum power is transferred by the source



- (A) $9\ \Omega$
(B) $5\ \Omega$
(C) $1\ \Omega$
(D) $8\ \Omega$
(E) Answer not known
58. Consider $5\ \Omega$ and $10\ \Omega$ resistor are connected in series and it is connected across the 50 V D.C. source. Find the voltage across $10\ \Omega$ resistor.
- (A) 5 V
(B) 33.3 V
(C) 66.6 V
(D) 16.7 V
(E) Answer not known

59. Find the voltage between A and B in a voltage divider network shown in figure

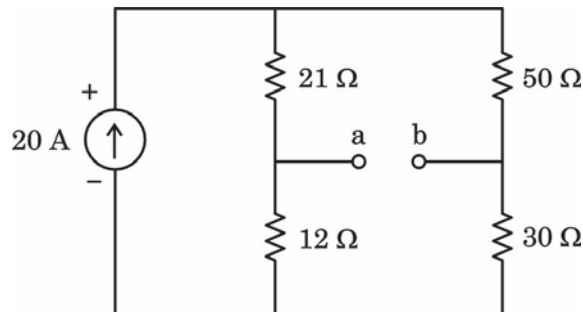


- (A) 90 V
(B) 100 V
(C) 91 V
(D) 80 V
(E) Answer not known
60. Application of Norton's theorem in suitable electric circuit will simplify that circuit into
- (A) A voltage source and a resistance in parallel
(B) A voltage source and a resistance in series
(C) A current source and a resistance in parallel
(D) A current source and a resistance in series
(E) Answer not known

61. NODAL analysis can be applied for

- (A) Planar networks
- (B) Non-planar networks
- (C) Both planar and non-planar networks
- (D) Neither planar non-planar networks
- (E) Answer not known

62. Find the equivalent Thevenin impedance across terminals “ a and b ”



- (A) 23.36
- (B) 113 Ω
- (C) 26.38 Ω
- (D) 24.37 Ω
- (E) Answer not known

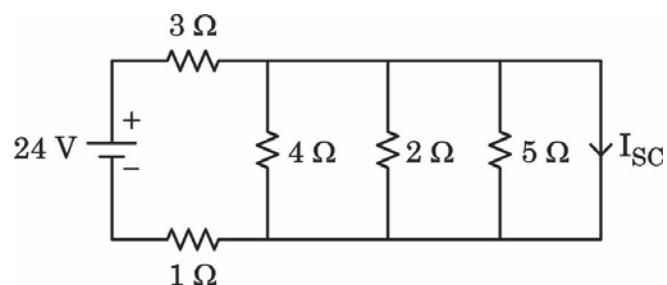
63. Identify the resistor across which, most voltage drop appears

- (A) 4.7 kΩ
- (B) 5.6 kΩ
- (C) 10 kΩ
- (D) 9 kΩ
- (E) Answer not known

64. In an electric circuit when elements are _____ connected, the current will be same

- (A) Parallel
- (B) Series
- (C) Open
- (D) Short
- (E) Answer not known

65. The current I_{SC} through the short circuit in the circuit shown is



- (A) 8 A
- (B) 6 A
- (C) 4 A
- (D) 1 A
- (E) Answer not known

66. Maxwell's first equation is described as

- (A) Differential form of Gauss's law
- (B) Integral form of Gauss's law
- (C) Differential form of Coulomb's law
- (D) Integral form of Coulomb's law
- (E) Answer not known

67. The unit of magnetic flux density is
- (A) Wb/m^2 (B) Wb/m^3
(C) Wbm^3 (D) Wbm^2
(E) Answer not known
68. Inductor opposes the change in
- (A) Magnetic flux
(B) Current
(C) Both (A) and (B)
(D) Voltage
(E) Answer not known
69. The equivalent self-inductance of two coils connected in series is
- (A) $L_1 + L_2$ (B) $\frac{1}{L_1 + L_2}$
(C) $\frac{1}{L_1} + \frac{1}{L_2}$ (D) $\frac{L_1 + L_2}{L_1 L_2}$
(E) Answer not known
70. The magnetic flux linked with a coil in weber is given by the equation $\phi = 6t^2 + 3t + 2$. Then the magnitude of induced emf in the coil at $t = 3$ sec will be
- (A) 39 V (B) 44 V
(C) 36 V (D) 50 V
(E) Answer not known

71. The relation between magnetization M and magnetic field intensity H is
- (A) $M = (1 + \chi_m)H$ (B) $M = \chi_m H$
 (C) $M = (1 - \chi_m)H$ (D) $M = \mu_0(1 + \chi_m)H$
 (E) Answer not known
72. The magneto motive force around a closed path is equal to
- (A) Conduction current
 (B) Conduction and displacement current
 (C) Displacement current
 (D) Magnetic field intensity
 (E) Answer not known
73. Two coils, a primary of 600 turns and a secondary of 30 turns are wound on an iron ring of mean radius 0.1 m and cross-section 4×10^{-2} m diameter. Find their mutual inductance (μ_r for iron = 800)
- (A) 3.15×10^{-2} H (B) 3.25×10^{-2} H
 (C) 3.45×10^{-2} H (D) 3.65×10^{-2} H
 (E) Answer not known
74. A very long solenoid with 2×2 cm cross section has an iron core ($\mu_r = 1000$) and 4000 turns per meter. The self inductance per meter will be
- (A) 8.042 mH/m (B) 8.425 H/m
 (C) 8.042 H/m (D) 8.525 H/m
 (E) Answer not known

75. The Lorentz force equation is

- (A) $\vec{F} = Q\vec{E}$ (B) $\vec{F} = Q(\vec{E} - \vec{u} \times \vec{B})$
(C) $\vec{F} = Q(\vec{E} + \vec{u} \times \vec{B})$ (D) $\vec{F} = Q\vec{u} \times \vec{B}$
(E) Answer not known

76. The electric field strength of a charge with reference to distance

- (A) Increase
(B) Decrease
(C) Decrease with square of distance
(D) Increase with square of distance
(E) Answer not known

77. Calculate the capacitance of a parallel-plate capacitor having a mica dielectric, $\epsilon_r = 6$, a plate area of 6.45 mm^2 and a separation of 25.4 mm

- (A) 1.46 nF (B) 1.38 nF
(C) 1.349 nF (D) 1.658 nF
(E) Answer not known

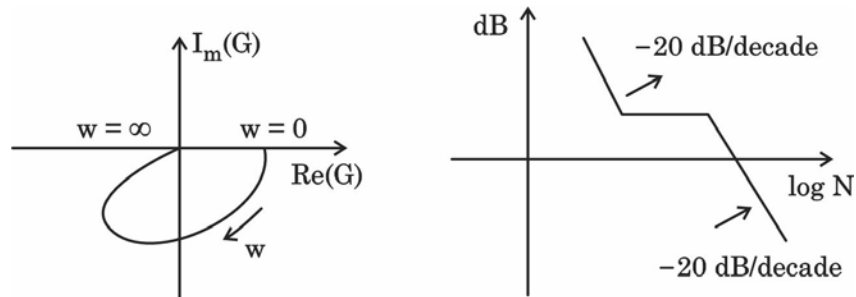
78. The energy stored in the capacitor

- (A) $\frac{1}{2}CV^2$ (B) $\frac{1}{2CV^2}$
(C) $\frac{1}{2}(CV)^2$ (D) $\frac{1}{2(CV)^2}$
(E) Answer not known

79. The work done in moving a positive charge on an equipotential surface is
- (A) Finite and positive (B) Finite and negative
(C) Infinite (D) Zero
(E) Answer not known
80. The potential at point $P(-4, 5, 6)$ present in the potential field, $V = 2x^2z - 6y$ is
- (A) -66 V (B) -162 V
(C) $+66\text{ V}$ (D) $+162\text{ V}$
(E) Answer not known
81. In the application of Gauss law, if D 's tangential to the surface, $D \cdot dS$ is
- (A) infinite (B) $D \cdot 4\pi r^2$
(C) $D \cdot 2\pi \rho l$ (D) Zero
(E) Answer not known
82. If $D = -48.2xy \cdot a_x + 16.24x^2 \cdot a_y + 24.6 \cdot a_z$, $p \text{ C/m}^2$ the volume charge density ρ_v will be
- (A) $-3.2y, p \text{ C/m}^3$ (B) $-24.6x, p \text{ C/m}^3$
(C) $-16.24x^2, p \text{ C/m}^3$ (D) $-48.2y, p \text{ C/m}^3$
(E) Answer not known

83. The desired boundary conditions for conductor – free space in electrostatics, states that
- (A) Static electric field intensity inside a conductor is infinite
 - (B) Static electric field intensity outside a conductor is zero
 - (C) Static electric field intensity is zero everywhere
 - (D) Static electric field intensity inside a conductor is zero
 - (E) Answer not known
84. For any electrostatic field to be conservative, it must satisfy
- (A) $\nabla \cdot E = 0$
 - (B) $\oint E \cdot dl = \rho$
 - (C) $\nabla \times E = 0$
 - (D) $\nabla \cdot E = Q$
 - (E) Answer not known
85. Two capacitors $c_1 = 1\mu F$ and $c_2 = 2\mu F$ are connected in parallel across a 100 V dc supply. The charge on capacitors are
- (A) $Q_1 = 100\mu C$ and $Q_2 = 200\mu C$
 - (B) $Q_1 = 200\mu C$ and $Q_1 = 100\mu C$
 - (C) $Q_1 = 100\mu C$ and $Q_2 = 50\mu C$
 - (D) $Q_1 = 50\mu C$ and $Q_2 = 100\mu C$
 - (E) Answer not known

86. Nyquist Plot and Bode Magnitude Plot of two systems are given in Figures



- (A) Both Systems are type 0
 (B) Both Systems are type 1
 (C) Systems I is type 0 and Systems II is type 1
 (D) Systems II is type 0 and Systems I is type 1
 (E) Answer not known
87. In the following properties of Jordan canonical form, determine the false one.
- (a) Elements of main diagonal are Eigen values
 (b) All the elements below main diagonal are zero
 (c) Number of Jordan blocks = Number of independent Eigen vectors
 (d) There is more then one linearly independent Eigen vector associated with each Jordan block
- (A) (a) (B) (b)
 (C) (c) (D) (d)
 (E) Answer not known

88. Compute solution of following Non-Homogeneous state equation where u is a unit step input.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

Assume initial condition as $x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

(A) $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$

(B) $\begin{bmatrix} \frac{3}{4} + \frac{1}{2}t + \frac{1}{4}e^{-2t} \\ \frac{1}{2}(1 - e^{-2t}) \end{bmatrix}$

(C) $\begin{bmatrix} -\frac{1}{4} + \frac{1}{2}t + \frac{1}{4}e^{-2t} \\ \frac{1}{2}(1 - e^{-2t}) \end{bmatrix}$

(D) $[i]$

(E) Answer not known

89. Consider the following plant of state space representation

$$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$

Determine for which B and C matrices it is both controllable and observable

(A) $B = \begin{bmatrix} -2 \\ -2 \end{bmatrix}; C = [-2 \quad -2]$

(B) $B = \begin{bmatrix} -2 \\ 2 \end{bmatrix}; C = [-2 \quad 0]$

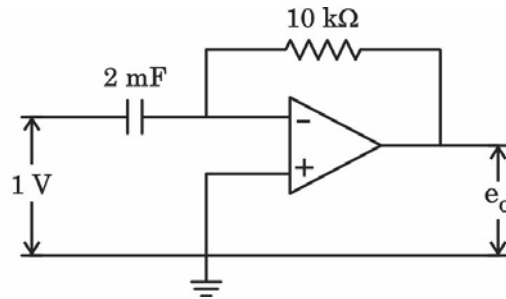
(C) $B = \begin{bmatrix} -2 \\ -2 \end{bmatrix}; C = [-2 \quad 0]$

(D) $B = \begin{bmatrix} -2 \\ 2 \end{bmatrix}; C = [-2 \quad -1]$

(E) Answer not known

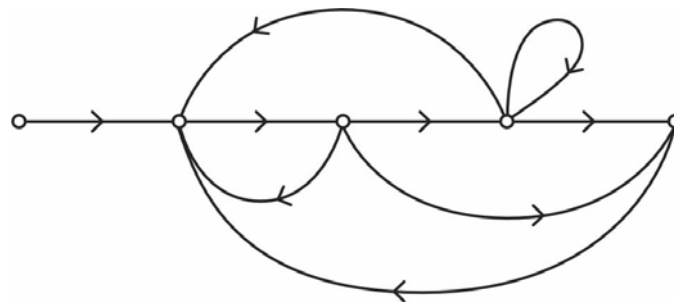
90. The transfer function $G(s) = C(SI - A)^{-1}B$ of the system $\dot{x} = Ax + Bu$, $y = Cx + Du$ has pole zero cancellation. The system is
- (A) Uncontrollable and Unobservable
 - (B) Observable and Uncontrollable
 - (C) Controllable and Unobservable
 - (D) May be either (A) or (B) or (C)
 - (E) Answer not known
91. The number of root locus branch terminate on infinity of the open loop transfer function $G(s) = \frac{k(s+a)}{s(s^2 + 4s + 12)}$ is
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
 - (E) Answer not known
92. The proportional integral controller has the effects of
- (A) Decreased type of the system, reduced steady state error
 - (B) Increased type of the system, reduced steady state error
 - (C) Reduced type of the system, increased steady state error
 - (D) Increased type and steady state error
 - (E) Answer not known

93. Determine the output voltage e_o for the following configuration



- (A) + 20 V (B) + 5 V
 (C) - 5 V (D) - 20 V
 (E) Answer not known
94. The loop transfer function of a system is given by $G(s) H(s) = \frac{k(s+10)^2 (s+100)}{s(s+25)}$ the number of loci terminating at infinity is
- (A) 0 (B) 1
 (C) 2 (D) 3
 (E) Answer not known
95. _____ is the range of damping ratio desirable from relative stability and speed of response considerations.
- (A) 0.4 to 0.7 (B) 0.6 to 0.9
 (C) 0.5 to 0.8 (D) 0.2 to 0.4
 (E) Answer not known

96. If the characteristic equation of a system is $s^3 + 14s^2 + 56s + k = 0$, it will be stable only at
- (A) $0 < k < 784$ (B) $10 > k < 660$
 (C) $1 < k < 64$ (D) $4 < k < 784$
 (E) Answer not known
97. The transfer function of a system $\frac{10}{1+s}$ has steady state error to step input as
- (A) 0 (B) $\frac{1}{11}$
 (C) 10 (D) ∞
 (E) Answer not known
98. How many combinations of two non-touching loops of the given signal flow graph?



- (A) 3 (B) 2
 (C) 4 (D) 5
 (E) Answer not known

99. If the unit step response of a system is unit impulse function, the transfer function of the system is
- (A) 1 (B) $\frac{1}{s}$
(C) s (D) $\frac{1}{s^2}$
(E) Answer not known
100. If there is a constant error in the output signals, derivative control will
- (A) reduce the error to zero
(B) reduce the error but not necessarily to zero
(C) have no effect on the error
(D) increase the error
(E) Answer not known
101. Large quantities of electrical energy can be stored using
- (A) Pumped hydro (B) Batteries
(C) Fly wheels (D) SMES
(E) Answer not known
102. For a wind speed 10 m/s and air density 1.226 J/kg.k/m³, the maximum power density is
- (A) 12.26 w/m² (B) 363 w/m²
(C) 245.2 w/m² (D) 613 w/m²
(E) Answer not known

103. The reverse reaction of electrolysis of water is called

- (A) Fuel cell process
- (B) Thermodynamic process
- (C) Chemical polarization
- (D) Electrical process
- (E) Answer not known

104. Assertion [A] : Wind turbines using aerodynamic lift produce more energy for a given swept area than wind turbine using aerodynamic drag?

Reason [R] : Lift produces more torque

- (A) [A] is true but [R] is false
- (B) Both [A] & [R] are true; and [R] is the correct explanation of [A]
- (C) [A] is false but [R] is true
- (D) Both [A] and [R] are false
- (E) Answer not known

105. Basic combination of gases used in a fuel cell are _____ and _____

- (A) Oxygen and Nitrogen
- (B) Hydrogen and Oxygen
- (C) Hydrogen and Nitrogen
- (D) Oxygen and Methane
- (E) Answer not known

106. Actual efficiency of a wind mill is

- (A) 35 %
- (B) 50 %
- (C) 40 %
- (D) 80 %
- (E) Answer not known

107. Assertion [A] : Smart grids are necessary for existing grids.
Reason [R] : To accept power injections from all distributed renewable sources to enhance economy and efficiency of the operating electric power networks.
- (A) [A] is true but [R] is false
(B) Both [A] and [R] are true and [R] is the correct explanation of [A]
(C) [A] is false but [R] is true
(D) Both [A] and [R] are true, but [R] is not the correct explanation
(E) Answer not known
108. Which concept is commonly used in demand-side management of power system?
- (A) grid to vehicle (G_2V) (B) vehicle to grid (V_2G)
(C) vehicle to home (V_2H) (D) grid to home (G_2H)
(E) Answer not known
109. Among the following acids, which is used as electrolyte in Fuel cell
- (A) Phosphoric acid (B) Sulfuric acid
(C) Carbonic acid (D) Hydrofluoric acid
(E) Answer not known

110. Batteries used in hybrid, plug-in and electric vehicles are

- (A) Primary batteries
- (B) Secondary batteries
- (C) Both primary and secondary batteries
- (D) Tertiary batteries
- (E) Answer not known

111. Wind turbine generator works on the principle of

- (A) Rotation
- (B) Momentum
- (C) Gravitation
- (D) Collision
- (E) Answer not known

112. The integration issues of wind unit with the grid include

- (A) Reactive power supply
- (B) Voltage regulation
- (C) Frequency control
- (D) Above all
- (E) Answer not known

113. Identify the statement that

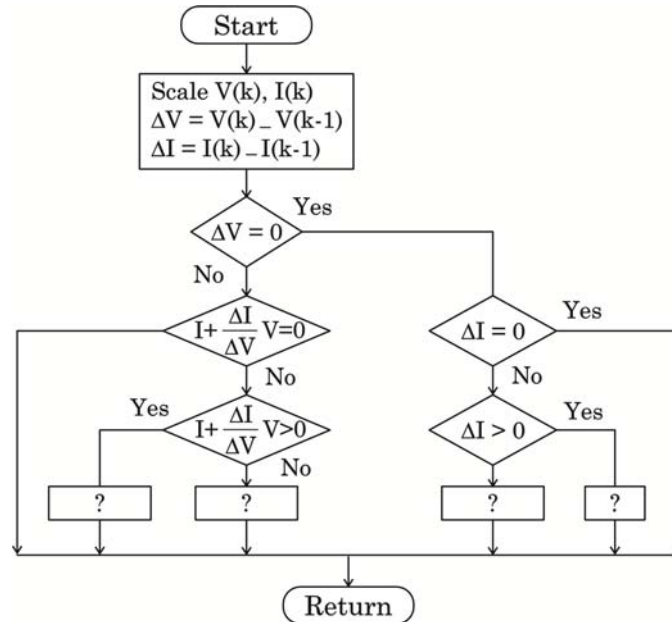
Best describes the process by which a pyrhelimeter measures solar radiation

- (A) Sun light – window in pyrhelimeter – Thermopile – Heat is converted into electrical signal – recorded
- (B) Sunlight – window in pyrhelimeter – heat is converted to electrical signal – thermopile – Recorded
- (C) Window in pyrhelimeter – sunlight – thermopile – heat is converted into electrical signal – recorded
- (D) Sunlight – heat is converted to electrical signal – window in pyrhelimeter – thermopile – recorded
- (E) Answer not known

114. As the temperature of a solar cell decreases how do the current and the voltage change

- (A) Current decreases and voltage increases
- (B) Current increases and voltage increases
- (C) Current decreases and voltage decreases
- (D) Current increases and voltage decreases
- (E) Answer not known

115. In solar PV system INC MPP tracking flow chart is given below. Identify the missing block in the flow chart



- (A) Decrease I_{ref} , increase I_{ref} , Decrease I_{ref} , Increase I_{ref}
- (B) Decrease V_{ref} increase V_{ref} , Decrease V_{ref} , Increase V_{ref}
- (C) Increase V_{ref} , Decrease V_{ref} , Decrease I_{ref} , Increase I_{ref}
- (D) Decrease V_{ref} , Decrease I_{ref} , Decrease V_{ref} , Increase I_{ref}
- (E) Answer not known

116. Assertion [A] : MPPT device is used in Solar PV in order to extract maximum power from solar PV throughout the day.
- Reason [R] : A MPPT device tries to match the impedance of the module with that of load/battery.
- (A) [A] is true but [R] is false
(B) Both [A] and [R] are true and [R] is the correct explanation of [A]
(C) [A] is false, [R] is true
(D) Both [A] and [R] are true but [R] is not the correct explanation of [A]
(E) Answer not known
117. The ministry for development, demonstration and utilization of renewable energy technologies in India is
- (A) Ministry of New and Renewable energy
(B) Ministry of Nominal and renewable sources
(C) Ministry of Conventional and non conventional energy
(D) Ministry of Numerical and renewable energy
(E) Answer not known
118. Solar energy received per square meter in India varies in the range _____ per day
- (A) 2 KWhr to 4 KWhr
(B) 4 KWhr to 7.5 KW/r
(C) 7.5 KWhr to 9 KWhr
(D) 9 KWhr to 12 KWhr
(E) Answer not known

119. Which type of solar cell provide the highest efficiency?
- (A) Mono crystalline
 - (B) Thin film technology
 - (C) Poly crystalline
 - (D) Amorphous solar cells
 - (E) Answer not known
120. The earth reflects back nearly _____ of the total solar radiant energy to the space by reflection and scattering.
- (A) 20%
 - (B) 10%
 - (C) 30%
 - (D) 50%
 - (E) Answer not known
121. Global warming would lead to
- (A) Increase of agriculture production
 - (B) Acid rains
 - (C) Change of climate pattern and its severity
 - (D) Increase the efficiency of heat engines
 - (E) Answer not known
122. _____ made the first measurement of spectral distribution from the sun
- (A) Samuel Langley
 - (B) Samuel Kennedy
 - (C) Albert Einstein
 - (D) Alexander Grahambell
 - (E) Answer not known

123. Which law states that the total energy radiated per unit surface area per unit time is directly proportional to fourth power of black body's temperature
- (A) Stefan – Boltzmann law (B) Ampear's law
(C) Faraday's law (D) Flemings rule's
(E) Answer not known
124. The diffuse radiation which is scattered by atmospheric particles
- (A) Has no unique direction
(B) Has unique direction
(C) Has short wavelength as compared to beam radiation
(D) Has larger magnitude as compared to beam radiation
(E) Answer not known
125. Photovoltaic cells have been made up of
- (A) Silicon (B) Carbon
(C) Gallium (D) Cadmium
(E) Answer not known
126. Which among the following is true with respect to PROM
- (A) AND array is fixed and OR array is programmable
(B) Both the AND array and OR array is programmable
(C) AND array is programmable and OR array is fixed
(D) Both the AND and OR array are fixed
(E) Answer not known

127. CMOS circuits are extensively used for on-chip computers mainly because of their
- (A) High packing density
 - (B) High noise immunity
 - (C) Low power dissipation
 - (D) Low cost
 - (E) Answer not known
128. The toggle mode for a J-K flip flop is
- (A) $J = 0, K = 0$
 - (B) $J = 1, K = 0$
 - (C) $J = 0, K = 1$
 - (D) $J = 1, K = 1$
 - (E) Answer not known
129. A counter has 14 stable states 0000 through 1101 if the input frequency is 50 KHz what will be its output frequency?
- (A) 3.57 KHz
 - (B) 4 KHz
 - (C) 2.8 KHz
 - (D) 4.5 KHz
 - (E) Answer not known
130. The resolution of a 4 bit ADC is 0.5 V. For an analog input of 6.6 V, the digital output of ADC will be
- (A) 1011
 - (B) 1101
 - (C) 1100
 - (D) 1110
 - (E) Answer not known
131. One-shot multivibrator is also known as _____ multivibrator.
- (A) Astable
 - (B) Monostable
 - (C) Bistable
 - (D) Astable/Monostable
 - (E) Answer not known

132. Which among the following decimal code is non weighted code

- (A) 8421
- (B) 2421
- (C) 5421
- (D) Excess 3 code
- (E) Answer not known

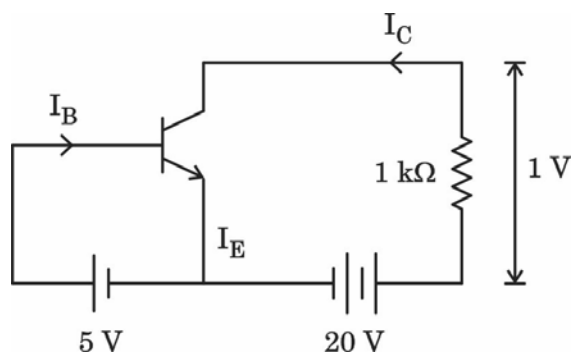
133. For which of the following flip flop, the output is clearly defined for all combination of two inputs?

- (A) JK flip flop
- (B) RS flip flop
- (C) T flip flop
- (D) Q flip flop
- (E) Answer not known

134. The range of output resistance of a common base transistor configuration is

- (A) Less than $100\ \Omega$
- (B) $500\ \Omega$ to $5\ K\Omega$
- (C) $10\ K\Omega$ to $50\ K\Omega$
- (D) More than $100\ \Omega$
- (E) Answer not known

135. For the circuit shown below, calculate collector current



- (A) 100 A
- (B) 1 A
- (C) 1 mA
- (D) 0.01 A
- (E) Answer not known

136. A tunnel diode oscillator is an example of
- (A) RC oscillators
 - (B) Crystal oscillators
 - (C) Tuned circuit oscillators
 - (D) Negative resistance oscillators
 - (E) Answer not known
137. The mobility of an electron in a conductor is expressed in terms of
- (A) $\text{m}^2/\text{V} - \text{S}$
 - (B) $\text{m}/\text{V} - \text{S}$
 - (C) m^2/V
 - (D) m^2/S
 - (E) Answer not known
138. A transistor has a current gain of 175. If the base current is 0.1 mA, then collector current is
- (A) 0.1 mA
 - (B) 175 mA
 - (C) 17.5 mA
 - (D) 1.75 A
 - (E) Answer not known
139. The superior characteristic of a Direct Coupled two stage amplifier using similar transistor is its
- (A) Temperature stability
 - (B) Avoidance of frequency sensitive components
 - (C) Utmost economy
 - (D) Ability to amplify direct current and low-frequency signals
 - (E) Answer not known

140. In the transistor, the emitter is
- (A) Lightly/Moderately doped
 - (B) Moderately doped
 - (C) Lightly doped
 - (D) Heavily doped
 - (E) Answer not known
141. Modem is an acronym of
- (A) Modulation
 - (B) Demodulation
 - (C) Modulation and demodulation
 - (D) modified demodulation
 - (E) Answer not known
142. The power requirement of an LED is
- (A) 40 mW per numeral
 - (B) $40\text{ }\mu\text{W}$ per numeral
 - (C) 10 W per numeral
 - (D) $10\text{ }\mu\text{W}$ per numeral
 - (E) Answer not known
143. The RF spectrum analysis covers a frequency range of
- (A) 10 GHz to 40 GHz
 - (B) 10 MHz to 100 MHz
 - (C) 10 MHz to 40 GHz
 - (D) 10 MHz to 10 GHz
 - (E) Answer not known

144. A meter has an internal resistance of $100\ \Omega$ and requires 1 mA for full scale deflection. It is to be converted to a 10 V ac. Total resistance of the half wave rectifier is $2250\ \Omega$. Find the sensitivity of the voltmeter on the ac range.
- (A) $200\ \Omega/V$ (B) $125\ \Omega/V$
(C) $225\ \Omega/V$ (D) $250\ \Omega/V$
(E) Answer not known
145. A distortion is defined as
- (A) Unwanted frequency
(B) Unwanted amplitude
(C) Change in shape of the waveform
(D) Unwanted signal
(E) Answer not known
146. Current in the RF range is measured by
- (A) Simple ammeter
(B) Ammeter using thermocouples
(C) Multirange ammeters
(D) Aryton shunt
(E) Answer not known
147. A 5 bit converter is used for a dc voltage range of 0-10 V. Find the range of MSB.
- (A) 10 V (B) 20 V
(C) 5 V (D) 50 V
(E) Answer not known

148. A linear displacement transducer normally uses
- (A) Straight binary code
 - (B) BCD
 - (C) Gray code
 - (D) Hexadecimal code
 - (E) Answer not known
149. A seven segment LCD display requires a power of
- (A) $20 \mu\text{W}/\text{segment}$
 - (B) $20 \text{ mW}/\text{segment}$
 - (C) $20 \text{ W}/\text{segment}$
 - (D) $20 \text{ nW}/\text{segment}$
 - (E) Answer not known
150. A multimeter consists of the following components
- (A) Ammeter, voltmeter and ohmmeter
 - (B) Galvanometer only
 - (C) Ammeter only
 - (D) Voltmeter only
 - (E) Answer not known
151. A wheat stone bridge has ratio arms of 1000Ω (both) and it is balanced with standard arm adjusted to 2154Ω . Find the value of unknown resistance
- (A) 2.154Ω
 - (B) 2154Ω
 - (C) $2154 \times 10^3 \Omega$
 - (D) 1154Ω
 - (E) Answer not known

152. The power in a 3 phase four wire circuit can be measured by using
- (A) 2 wattmeters
 - (B) 4 wattmeters
 - (C) 3 wattmeters
 - (D) 1 wattmeter
 - (E) Answer not known
153. The secondary winding of a CT should not be kept open without the ammeter while the primary is carrying current. If the secondary is kept open.
- (A) No change
 - (B) High voltage will be induced
 - (C) Low voltage will be induced
 - (D) High voltage due to higher value of flux density and cause insulation breakdown
 - (E) Answer not known
154. The material of wires used for making resistance strands is usually
- (A) Manganin
 - (B) Nichrome
 - (C) Copper
 - (D) Phosphor bronze
 - (E) Answer not known
155. A PMMC uses a
- (A) Taut band
 - (B) Moving coil
 - (C) Electrodynamometer
 - (D) Moving iron type
 - (E) Answer not known

156. Improper setting of range of a multimeter leads to an error called
- (A) Random error
 - (B) Limiting error
 - (C) Instrumental error
 - (D) Observational error
 - (E) Answer not known
157. 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
 - (E) Answer not known
158. ————— has the property of high permeability, low loss and small retentivity hence used in current transformers.
- (A) Permendur
 - (B) Mumetal
 - (C) Silicon steel
 - (D) Hipernik
 - (E) Answer not known
159. Frequency can be measured by using
- (A) Wein's bridge
 - (B) Maxwell's bridge
 - (C) Schering bridge
 - (D) Heaviside Campbell bridge
 - (E) Answer not known

160. The swamping resistor is used in a PMMC instrument to
- (A) Increase the instrument's damping
 - (B) Reduce the current to safe levels
 - (C) Compensate for temperature coefficients
 - (D) Boost the full scale sensitivity
 - (E) Answer not known
161. The working principle of a 3-phase induction motor is similar to which of the following?
- (A) Synchronous motor
 - (B) Three phase synchronous reluctance motor
 - (C) Three phase shaded pole motor
 - (D) Transformer with secondary started
 - (E) Answer not known
162. The step angle of a Three-phase steppes motor with four rotor teeth is
- (A) 0°
 - (B) 30°
 - (C) 60°
 - (D) 90°
 - (E) Answer not known
163. The load taken up by synchronous machines directly depends upon its
- (A) Starting torque
 - (B) Current
 - (C) Driving torque
 - (D) Rating
 - (E) Answer not known

164. A slip ring induction Motor runs at 970 rpm on full load when connected to 50 Hz supply. calculate the no.of poles and % slip synchronous speed of a motor is 1000 rpm.
- (A) 4 poles and 3% slip (B) 4 poles and 4% slip
 (C) 8 poles and 3% slip (D) 6 poles and 3% slip
 (E) Answer not known
165. Consider the following statements, which one of the following is not true regarding synchronous motors?
- (A) Requires DC excitation at the Rotor
 (B) Remains constant speed from No load to full load
 (C) Can be made to operate from lagging to leading power factor
 (D) Speed decreases with load
 (E) Answer not known
166. In a SCIM, torque with auto starter is _____ times the torque with direct - switching (where $k \rightarrow$ Transformation ratio of Induction motor)
- (A) k^2 (B) k
 (C) $\frac{1}{k^2}$ (D) $\frac{1}{k}$
 (E) Answer not known

167. In a Double squirrel cage Induction Motor, the outer cage consists of bars of _____ resistance where as the inner cage consists of _____-resistance copper bars.
- (A) High, High (B) High, Low
(C) Low, Low (D) Low, High
(E) Answer not known
168. If the rated voltage is reduced by one - half, then starting torque of squirrel cage Induction motor will be _____ of the starting torque with full voltage.
- (A) $\frac{1}{2}$ (B) $\frac{1}{4}$
(C) $\frac{1}{\sqrt{2}}$ (D) 0
(E) Answer not known
169. The permanent magnets used in BLDC motors.
- (A) Alnico Magnets (B) Ceramic Magnets
(C) Rare - earth Magnets (D) All the above
(E) Answer not known
170. Out of the following conditions, the one which need not have to be met by alternators during the parallel operation is
- (A) Terminal voltage of each machine must be the same
(B) The machines must have the same phase
(C) the machines must have equal power ratings
(D) The machines must operate at the same frequency
(E) Answer not known

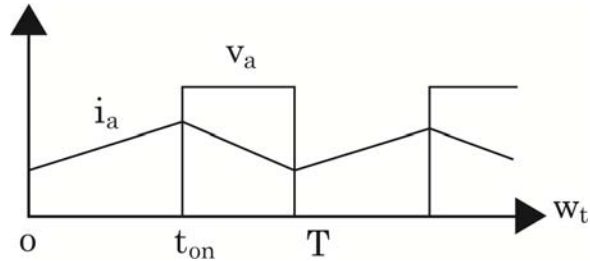
171. Blocked rotor test on a 3- ϕ induction motor is not suitable to find.
- (A) Short circuit current with normal voltage
 - (B) Short - circuit power factor
 - (C) Fixed losses
 - (D) Motor resistance as referred to stator
 - (E) Answer not known
172. In synchronous machine at lagging p.f. for the same field excitation, the terminal voltage is decreased from E_o to V because of
- (A) Under excitation
 - (B) Over excitation
 - (C) Lag of power
 - (D) Drop due to armature resistance and leakage reactance
 - (E) Answer not known
173. The torque of an induction motor is proportional to
- (A) $\frac{1}{V}$
 - (B) $\sqrt{V}$
 - (C) V^2
 - (D) V^3
 - (E) Answer not known
174. Open - circuit test on a transformer is conducted to determine
- (A) Copper loss
 - (B) Core loss
 - (C) Total loss
 - (D) Insulation Resistance
 - (E) Answer not known

175. A D.C compound Generator having full load terminal voltage equal to the No-load voltage is called ————— generator.
- (A) Under compounded (B) Over compounded
(C) Flat compounded (D) Shunt
(E) Answer not known
176. If the secondary turns in the transformer are doubled and primary voltage is reduced by half, then the secondary voltage will
- (A) be halved (B) be four times high
(C) not change (D) be reduced to a quarter
(E) Answer not known
177. The core flux of a practical transformer with A R load.
- (A) Decreases with increased load
(B) Increases linearly with load
(C) Increases as the square root of the load
(D) Is constant with load changes
(E) Answer not known
178. The induced emf in a dc machines while running at 500 rpm is 120V. The induced emf when the machine is running at 800 rpm will be
- (A) 320 V (B) 216 V
(C) 192 V (D) 160 V
(E) Answer not known

179. The current drawn by a 220V DC motor having armature resistance 0.5Ω and back emf 200V is
- (A) 20 A (B) 40 A
(C) 10 A (D) 80 A
(E) Answer not known
180. Wave winding is suitable for _____current _____ voltage D.C generators.
- (A) High, Low (B) High, High
(C) Low, Low (D) Low, high
(E) Answer not known
181. An ideal transformer is one which has
- (A) No losses and magnetic leakage
(B) Inter leaved primary and secondary Windings
(C) A common core for primary and secondary Windings
(D) A cone made of stainless steel and Windings of pure copper
(E) Answer not known
182. A single phase transformer of 500 KVA, 3300/500 V, 50 Hz has a maximum efficiency of 96% and occurs at 78% of full load at 0.85 power factor. The copper losses increased from the transformer is
- (A) 5,630 Watts (B) 4,320 Watts
(C) 5,799 Watts (D) 6,630 Watts
(E) Answer not known

183. The most feasible connection in three phase transformers to allow the flow of third harmonic current to maintain sinusoidal line voltage will be
- (A) Delta - Delta
 - (B) Open Delta
 - (C) Star - Star
 - (D) Star - Delta
 - (E) Answer not known
184. A series motor has a resistance of 2 ohms and it runs at 800 rpm with supply voltage of 220 V taking a current of 10 A. The values of induced emf after connecting a resistance of 5Ω in series to the existing one is
- (A) 110 V
 - (B) 140 V
 - (C) 150 V
 - (D) 200 V
 - (E) Answer not known
185. In transformer, the mechanical stress in audible bandwidth resulting in humming noise is mainly due to
- (A) lamination being poor
 - (B) transformer oil deterioration
 - (C) tank wall corrosion
 - (D) magnetostriction
 - (E) Answer not known

186. The voltage and current wave forms of the Regenerative braking of separately excited DC motor by chopper control shown in Fig.



Identify the energy storage period and duty period

- (A) $t_{on} \leq t \leq T \mid 0 \leq t \leq t_{on}$
 (B) $0 \leq t \leq t_{on} \mid t_{on} \leq t \leq T$
 (C) $0 \leq t \leq T \mid toff \leq t \leq T$
 (D) $T \leq t_{on} \leq t_{on} \mid t_{on} \leq t \leq T$
 (E) Answer not known
187. Which of the following statements are correct?
- (1) In Off-line UPS, there is no momentary interruption
 - (2) In On-line UPS, there is no momentary interruption
 - (3) Rating of the batteries is expressed in watt-hour
 - (4) Nickel-cadmium batteries are better than lead-acid batteries in UPS
- (A) (1), (4)
 (B) (2), (3)
 (C) (1), (3)
 (D) (2), (4)
 (E) Answer not known

188. For constant torque load, increasing rotor resistance of an induction motor, which is supplied from a balanced 3ϕ supply will
- (A) increase the speed (B) decrease the speed
 (C) keep the speed unchanged (D) increase the stator current
 (E) Answer not known
189. With constant margin angle control of synchronous motor, for successful commutation of thyristor in the converter, the duration for which the thyristor under commutation is subjected to reverse bias after current through it has fallen to zero (γ) should satisfy the following condition.
- (Assume tq as turn off time of thyristor and w as frequency of motor)
- (A) $\gamma > wtq$ (B) $\gamma < wtq$
 (C) $\gamma = wtq$ (D) $\gamma = \frac{1}{wtq}$
 (E) Answer not known
190. A DC chopper has ON time of 1.5 ms in a overall cycle time of 3 ms is supplied from a 200 V DC source. The average and rms value of the load voltage are respectively,
- (A) 100 V, 50 V (B) 141.42 V, 100 V
 (C) 50 V, 100 V (D) 100 V, 141.42 V
 (E) Answer not known

191. _____ are only suitable for a one-quadrant operation.
- (A) Half-wave converters (B) Full-wave converters
(C) Semi-converters (D) Dual-converters
(E) Answer not known
192. A separately excited DC motor is fed from 220 V DC source. The load torque is 30 Nm at a speed of 1000 rpm. The motor has $R_a = 1\Omega$, $L_a = 20\text{ mH}$ and $K_m = 1.5\text{ V} - \text{sec/rad}$. What is the value of armature current?
- (A) 45 A (B) 20 A
(C) 13.3 A (D) 24.9 A
(E) Answer not known
193. IGCT is a
- (1) Three layer device
 - (2) Four terminal device
 - (3) Voltage controlled device
 - (4) Current controlled device
 - (5) Hard turn on device
 - (6) Hard turn off device
- From the above the correct statement are
- (A) (1), (3), (6)
(B) (1), (2), (4), (5)
(C) (3), (5)
(D) (4), (6)
(E) Answer not known

194. In single-pulse modulation used in PWM inverters, V_S is the input DC voltage. To eliminate third harmonic, the required pulse width and the corresponding RMS value of fundamental component of output voltage are respectively.

- | | |
|--|---|
| (A) $120^\circ, \frac{2\sqrt{2} \cdot V_S}{\pi}$ | (B) $60^\circ, \frac{4V_S}{\pi} V_S$ |
| (C) $60^\circ, \frac{2\sqrt{3}}{\pi} V_S$ | (D) $120^\circ, \frac{\sqrt{6}}{\pi} V_S$ |
| (E) Answer not known | |

195. Switching-off of the devices with the help of their gate or base currents is called

- | | |
|----------------------|----------------------|
| (A) Line Commutation | (B) Self Commutation |
| (C) Load Commutation | (D) Gate Commutation |
| (E) Answer not known | |

196. SCRs and diodes are assumed ideal switches when

- (i) No voltage drop across them
 - (ii) No reverse current exists under reverse voltage conditions
 - (iii) $t_{on} = t_{off} = 0$
 - (iv) Holding current is zero
- | |
|-------------------------------|
| (A) (i) and (ii) |
| (B) (i) and (iv) |
| (C) (i), (iii) and (iv) |
| (D) (i), (ii), (iii) and (iv) |
| (E) Answer not known |

197. Which type of commutation is essential for PWM inverter employing thyristors as switches?
- (A) Line Commutation (B) Forced Commutation
(C) Load Commutation (D) Self Commutation
(E) Answer not known
198. The average output voltage of a full-wave diode rectifier with a center - tapped transformer is
- (A) $\frac{2V_m}{\pi}$ (B) $\frac{V_m}{\pi}$
(C) $\frac{V_m}{2\pi}$ (D) $\frac{V_m}{\sqrt{2}\pi}$
(E) Answer not known
199. In switching characteristics of thyristors, the delay time can be decreased by applying _____ gate current and _____ forward voltage between anode and cathode.
- (A) high and more (B) high and less
(C) low and more (D) low and less
(E) Answer not known
200. A single-phase full bridge inverter can operate in load commutation mode in case load consists of
- (A) RL (B) RLC critically damped
(C) RLC under damped (D) RLC overdamped
(E) Answer not known