075/2022

Question Booklet Alpha Code **A**

Question Booklet Serial Number

Total No. of Questions : 100 **Time : 1 Hour 30 Minutes**

Maximum : 100 Marks

INSTRUCTIONS TO CANDIDATES

1. The question paper will be given in the form of a Question Booklet. There will be four versions of question booklets with Question Booklet Alpha Code viz. A, B, C & D.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the question booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a question booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your question booklet is un-numbered, please get it replaced by new question booklet with same alpha code.
6. The question booklet will be sealed at the middle of the right margin. Candidate should not open the question booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the question booklet supplied to him contains all the 100 questions in serial order. The question booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. Blank sheets of paper is attached to the question booklet. These may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball-Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

Total Marks : 100 Marks

Time : 1 hour and 30 minutes

1. A dc voltage of 40 V is applied across series connected resistors 4 Ω and 3 Ω. Find the current through 2 Ω resistance if it is connected across 4 Ω resistor.

(A) 6.1 A (B) 3.2 A

(C) 12.2 A (D) 1.3 A

2. Maximum power transferred from source to load when its Thevenin's equivalent resistance is _____ the load resistance.

(A) greater than (B) less than

(C) equal to (D) half

3. Three resistors R_{AB}, R_{BC} and R_{CA} are connected in delta whose values are in the ratio 1 : 2 : 4, then the ratio of its equivalent resistance in star ($R_A : R_B : R_C$) is

(A) 3 : 2 : 4 (B) 2 : 1 : 4

(C) 3 : 1 : 6 (D) 4 : 1 : 8

4. The reactive power of a RLC circuit connected to an ac source is proportional to

(A) Average energy stored in the electric field

(B) Average energy stored in the magnetic field

(C) Sum of energy stored in electrical field and magnetic field

(D) Difference between energy stored in electrical field and magnetic field

5. The resonant frequency of a RLC series circuit is f_0. If the values of parameters are halved, then the resonant frequency is

(A) f_0 (B) $f_0/2$

(C) $4f_0$ (D) $2f_0$

6. If the amplitude of the voltage applied to a R = 8 Ω, X_L= 6 Ω series circuit is 150 V. The current through the circuit is _____ A.

(A) 15 (B) 10.6

(C) 1.5 (D) 1.06

7. Two coils A and B of same material are connected in parallel across the supply. Coil A has diameter and length double that of coil B. The heat produced by the coil A is _____ that of coil B.

(A) more than (B) less than

(C) equal (D) None of these

8. The power factor of a RLC series circuit connected across 230 V, 50 Hz supply is 0.8. If the capacitor is removed from the circuit, then the power factor becomes 0.625. What will be the power factor if inductor is also removed from the circuit ?

(A) 0.8 (B) 0.625
(C) 0.45 (D) None of these

9. A 1 μF capacitor is charged to 400 V. Find the value of voltage to which the capacitor is discharged if 0.06 J energy is removed from the capacitor.

(A) 300 (B) 200
(C) 150 (D) None of these

10. The quality factor of a RC series circuit is _____ to power factor.

(A) directly proportional (B) inversely proportional
(C) equal (D) None of these

11. The magnetic susceptibility of a paramagnetic material is _____.

(A) less than one but positive (B) less than one but negative
(C) more than one (D) None of these

12. The self-inductance of coil A is L_A and that of coil B is L_B. By keeping mutual inductance between the coils same, if the self-inductance of coil B is increased 4 times, what will be the change in coupling co-efficient, K ?

(A) Reduced by half (B) Increased 2 times
(C) Increased 4 times (D) Reduced by one-fourth

13. The two inductance coils A and B in series with the axis of one coil perpendicular to the axis of the other, then the mutual inductance is

(A) one (B) 2.5
(C) zero (D) 5

14. Energy stored in an inductive coil is _____ to square of current.

(A) inversely proportional (B) equal
(C) directly proportional (D) None of these

15. A coil has a time constant of 2 second and an inductance of 4 H. If the coil is connected to 40 V source, what will be the rate of rise of current in A/sec at the instant of switching ?

(A) 10 (B) 20
(C) 2.5 (D) 2

16. The ratio of magnetization to magnetizing force is called

(A) Relative permeability (B) Magnetic flux density
(C) Magnetic field intensity (D) Magnetic susceptibility

17. The potential inside a charged hollow sphere is

(A) Zero (B) Less than that on the surface
(C) Same as that on the surface (D) None of the above

18. The area of hysteresis loop is a measure of

(A) Energy loss per cycle (B) Magnetic flux

(C) Permeance (D) Mmf per cycle

19. The Faraday's law of electromagnetic induction and Lenz's law are summarized in the equation

(A) $e = LR$ (B) $e = L\ di/dt$

(C) $e = -d\psi/dt$ (D) None of the above

20. The magnetic field required to reduce the residual magnetization to zero is called

(A) retentivity (B) coercivity

(C) hysteresis (D) saturation magnetisation

21. Distribution transformers are designed for lower _____

(A) iron losses (B) power factor

(C) copper losses (D) windage losses

22. The mechanical characteristics of a dc motor is

(A) current versus torque

(B) efficiency versus speed

(C) current versus speed

(D) torque versus speed

23. What will be the number of poles to get maximum speed for an alternator ?

(A) 4 (B) 6

(C) 2 (D) 8

24. The starting torque of a three phase induction motor is directly proportional to

(A) V (B) V^3

(C) V^2 (D) $V^{1/2}$

25. Carbon brushes are preferred over copper brushes in dc machines

(A) Due to self-lubricating property

(B) Lesser weight

(C) Lesser size

(D) None of these

26. What will be the change in emf induced in a dc generator if flux is reduced by 20% and speed is increased by 20% ?

(A) 8% reduced (B) 4% increased

(C) 8% increased (D) 4% reduced

27. A dc motor connected to 220 V supply takes 60 A. The power developed in the armature is maximum when the back emf is _____ V.

(A) 220 (B) 110

(C) 55 (D) 440

28. If the primary current of transformer is twice the secondary current, then it is named _____ transformer.

(A) Step down
(B) One to one
(C) Ideal
(D) Step up

29. The iron-silicon alloy core is used in a transformer to

(A) Ensure high permeability of the magnetic circuit
(B) Keep the minimum iron loss
(C) (A) and (B)
(D) None of these

30. The most economically used transformer connection is _____ for small current and high voltage applications.

(A) Star-star
(B) Delta-star
(C) Star-delta
(D) Delta-delta

31. The octal number 752.222 is equivalent to which of the following ?

(A) [l A9.2A]16
(B) [1EA.49]16
(C) [l A8.A3]16
(D) [l B0.B0]16

32. A 4 bit ripple counter and a 4 bit synchronous counter are made using flip flops having a propagation delay of 10n seconds each. If the worst case delay in the ripple counter and the synchronous counter be R and S respectively, then

(A) R = 10ns, S = 40ns
(B) R = 40ns, S = 10ns
(C) R = 10ns, S = 30ns
(D) R = 30ns, S = 10ns

33. Which combinational circuit is well-known for selecting a single input from multiple inputs & guiding the binary information to output line ?

(A) Data selector
(B) Data distributor
(C) Both data selector and data distributor
(D) De-multiplexer

34. How many NOT gates are required for the construction of a 4 to 1 multiplexer from the followings ?

(A) 3
(B) 4
(C) 2
(D) 5

35. In the case of adder circuits the carry propagation can be expressed as

(A) Cp = A – B
(B) All but Y0 are LOW
(C) Cp = A + B
(D) All but Y0 are HIGH

36. The design and architecture of an arithmetic and logic circuit is established on which scheme ?

(A) Sequential logic
(B) Combinational logic
(C) Multiplexing
(D) De-Multiplexing

37. The clock frequency of an 8085 microprocessor is 10 MHz and time required to execute an instruction is 1.2 μsec, then the T states needed for executing the instruction is

(A) 3 (B) 8
(C) 5 (D) 12

38. When two processors 1 and 2 executing the same instruction set and under identical conditions then a same input program running on second processor takes 25% less time but incurs 20% more clock cycles per instruction as compared to the program running on first processor. If the clock frequency of first processor is 1 GHz, then the frequency of second processor is

(A) 1.1 GHz (B) 1.03 GHz
(C) 2.3 GHz (D) 1.6 GHz

39. In 8085 assembly language, a sequence of two registers that multiplies the content of DE register pair by two and stores that result in HL register pair is

(A) XCHG & DAD B (B) XTHL & DAD H
(C) PCHL & DAD D (D) XCHG & DAD H

40. Find the resolution of a 10-bit analog to digital converter for an input range of 10 V.

(A) 97.7 mV (B) 9.77 mV
(C) 0.977 mV (D) 977 mV

41. With available head of 1 m to develop 1 HP power output from a hydroelectric power plant, the speed at which the turbine will rotate is called

(A) Specific speed (B) Synchronous speed
(C) Asynchronous speed (D) Actual speed

42. A moderator which is used in nuclear power plant to slow down the fast moving neutrons should have

(A) High molecular weight (B) High fishing property
(C) High neutron weight (D) Low molecular weight

43. A conductor is composed of seven identical copper strands, each having a radius of 2 cm. Then the self GMD of the conductor will be

(A) 2.77 cm (B) 2.177 cm
(C) 4.35 cm (D) 4.12 cm

44. A circuit breaker has interrupted the current at the instant when its value is 5 kA with inductance 10 mH and capacitance 1 μF. What will be resistance value required for resistance switching process ?

(A) 10.25 Ω (B) 20.22 Ω
(C) 40.2 Ω (D) 50 Ω

45. An over current relay of current rating 5 A and setting 150% is connected to a 200/5A CT. Then the line current required to pick up the relay is

(A) 200 A (B) 150.5 A
(C) 300 A (D) 320 A

46. The most appropriate way of mitigating the problem of interference between power line and communication line is to

(A) Transpose the power line
(B) Transpose the communication line
(C) Use double circuit power line
(D) Use bundled conductor power line

47. What will be the nature of fault if a power system is subjected to a fault which makes the zero sequence component of actual current equal to zero ?

(A) LG fault
(B) LL fault
(C) LLLG fault
(D) LLG fault

48. Which of the following stability is increased with the use of high speed circuit breakers in power system ?

(A) Frequency stability
(B) Steady state stability
(C) Transient stability
(D) All of the above

49. A transmission line has 4 units of string insulators. The voltage across the bottom most unit is 45% of the total voltage, then the string efficiency of the arrangement is

(A) 33.33%
(B) 25%
(C) 66.67%
(D) 55.55%

50. A single phase two conductor line separated at a distance 1.5 m apart with radius of 2 cm each, produce a self-inductance of

(A) 1.83 mH/kM
(B) l.l mH/kM
(C) 2.81 mH/kM
(D) 0.828 mH/kM

51. Class A commutation is also called _____.

(A) Self commutation
(B) Resonant pulse commutation
(C) Complementary commutation
(D) Line commutation

52. The advantages of using freewheeling diode are

(A) Input power factor is improved
(B) Load current waveform is improved
(C) Better load performance
(D) All of the above

53. A step up chopper has an input voltage of 200 V. The conduction time of the thyristor is 300 μs and the output voltage is 600 V. If the pulse width is halved for constant frequency operation, the new output voltage is

(A) 450 V
(B) 400 V
(C) 300 V
(D) 500 V

54. Three SCRs are connected to form a series string. The voltage across these thyristors are 300 V, 250 V and 200 V respectively. If the current flowing through these thyristors are 5 A, 9 A and 11 A respectively, what will be the value of equalising resistance to be connected across each SCR's ?

(A) 10 Ω
(B) 13 Ω
(C) 15 Ω
(D) 12 Ω

55. Snubber circuits are used with thyristors to

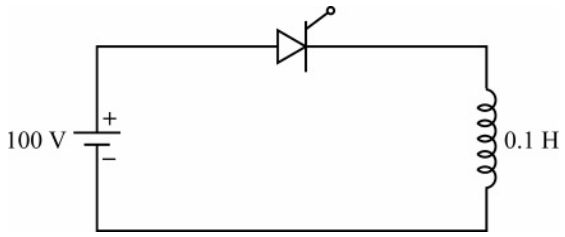
(A) Protect the gate circuit

(B) Limit the rate of rise of voltage, $\frac{dv}{dt}$

(C) Limit the rate of rise of current, $\frac{di}{dt}$

(D) Turn on the thyristor at a voltage less than its forward break over voltage

56. If the latching current of a thyristor is 4 mA, then the minimum width of the gate pulse required to properly turn on the thyristor shown in the circuit below is _____.



(A) 1 μs (B) 2 μs

(C) 4 μs (D) 8 μs

57. The peak inverse voltage of a single phase fullwave bridge rectifier is

(A) $\frac{V_m}{\pi}$ (B) V_m

(C) $2V_m$ (D) $\frac{2V_m}{\pi}$

58. Op-amp has differential gain of 10,000 and CMMR of 100 dB. The common mode voltage gain is

(A) 10 (B) 100

(C) 1 (D) 0.1

59. Which is not a characteristic of an ideal op-amp ?

(A) Infinite slew rate (B) Infinite band width

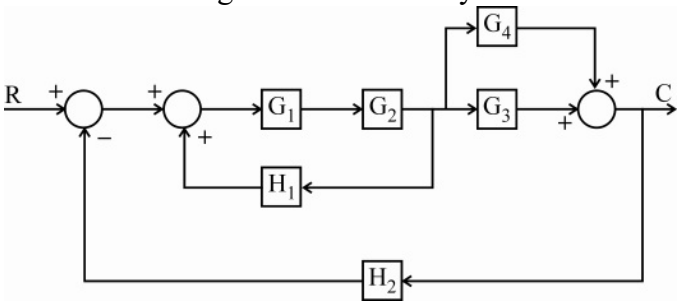
(C) High output impedance (D) High CMMR

60. The output of an op-amp increase 8 V in 14 μs. The slew rate is

(A) 1.25 (B) 0.87

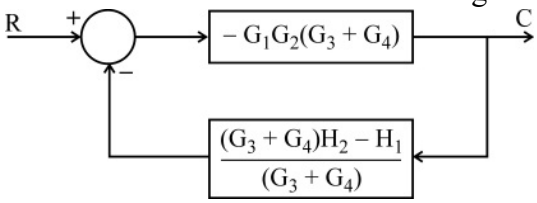
(C) 0.57 (D) 1.25

61. Consider the block diagram of a control system shown in figure below.

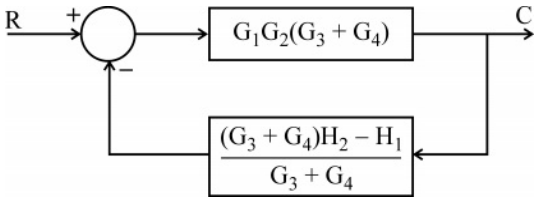


The canonical form of the above block diagram is

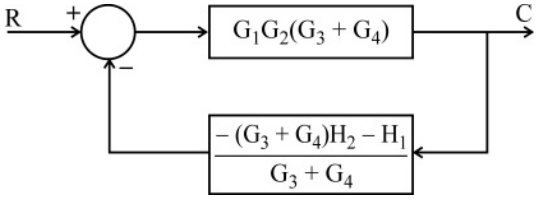
(A)



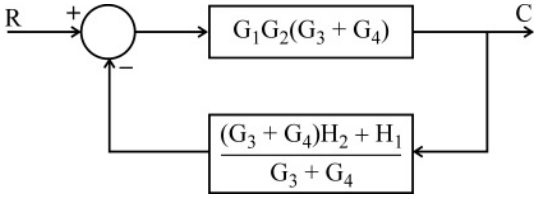
(B)



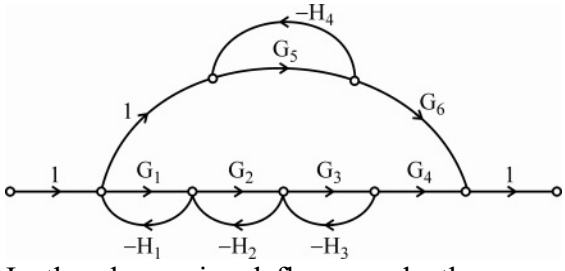
(C)



(D)



62.



In the above signal flow graph, there are _____ number of combinations of two non-touching loops.

(A) 2 (B) 3

(C) 4 (D) 5

63. A system produces an output $\frac{12}{S(S^2 + 5S + 4)}$, for a unit step input.

The nature of the response is

(A) undamped (B) under damped

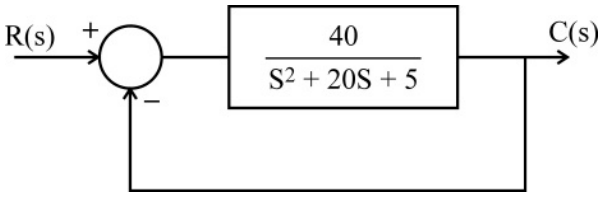
(C) critically damped (D) over damped

64. The peak time T_p = 3 second for a system to which unit step input is applied. The damping frequency in radians/second is

(A) 1.57 (B) 1.05

(C) 0.95 (D) 0.64

65.



The positional error co-efficient is

(A) 8 (B) 9

(C) 6 (D) 5

66. The open loop transfer function of a unity feedback control system is

$$G(s) = \frac{1}{S^2 + 6S + 9}$$

The closed loop transfer function will have poles at

(A) – 3, – 3 (B) 3 ± 1 j

(C) – 3 ± 1 j (D) – 3, 3

67. In type – 1 system, the velocity lag error is

(A) Inversely proportional to band width of the system.

(B) Directly proportional to the gain constant.

(C) Inversely proportional to the gain constant.

(D) Independent of gain constant.

68. Which of the following is true for Routh's criterion ?

1. It gives an idea about absolute stability.
2. The degree of instability and means to avoid it is not indicated by Routh's criterion.
3. It indicates the number and values of unstable roots.

(A) Both 1 & 2 (B) Both 2 & 3

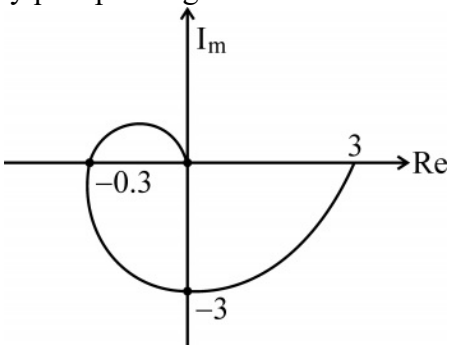
(C) Both 1 & 3 (D) All of 1, 2 & 3

69. The effects of adding poles and zeros can be determined quickly by

(A) Nicholas chart (B) Nyquist plot

(C) Root locus (D) Bode plot

70. The Nyquist plot is given as



The gain margin is

(A) 3.33 (B) – 3.33

(C) 0.33 (D) – 0.33

71. The resistance of a moving coil voltmeter is 13500 Ω. The moving coil has 150 turns and is 4 cm long and 3 cm wide. The flux density in the air gap is 5.5×10^{-2} Wb /m^2. Find the deflection torque produced by 150 V.

(A) 11×10^{-5} N-m (B) 1.5 N-m

(C) 1.4 N-m (D) 18×10^{-7} N-m

72. Which of the following is not an integrating instrument ?

(A) Electrolytic meters (B) Motor meter

(C) Clock meter (D) Galvanometer

73. Calculate the shunt resistance required for converting a 2 mA meter with internal resistance of 60 Ω into 0-100 mA ammeter.

(A) 0.5 Ω (B) 1.22 Ω

(C) 2.202 Ω (D) 3.05 Ω

74. Fluid friction damping can be used for

(A) horizontally mounted instruments (B) vertically mounted instruments

(C) both (A) and (B) (D) None

75. The sensitivity of an oscilloscope depends on

(A) gain of vertical amplifier (B) gain of horizontal amplifier

(C) sweep generator (D) None of the above

76. Power loss can be considerably reduced while testing energy meter by

(A) direct lamp loading (B) direct resistance loading

(C) phantom loading (D) direct R-L loading

77. Speed of rotation of Induction type energy meter can be controlled by

(A) adjusting the position of braking magnet

(B) reversing the supply terminals

(C) reversing load terminals

(D) None of the above

78. The aquadag coating in CRO is used to collect

(A) primary electrons (B) secondary emission electrons
(C) both (A) and (B) (D) None of the above

79. The sweep generator of a CRO is used to produce

(A) A sawtooth voltage for the horizontal deflection of electron beam.
(B) A sinusoidal voltage for the vertical deflection of the electron beam
(C) A sinusoidal voltage for the horizontal deflection of the electron beam
(D) A sawtooth voltage for the vertical deflection of the electron beam

80. A moving coil ammeter has a uniform scale with 100 divisions and gives full scale reading of 10 A. The instrument can read upto $1/5^{th}$ of a scale division with a fair degree of certainity. Determine the resolution of the instrument in amperes.

(A) 0.01 A (B) 0.04 A
(C) 0.02 A (D) 0.03 A

81. Which of the following system has memory ?

(A) $y(t) = x(t)$ (B) $y(t) = tx(t) + 2x(t)$
(C) $y(t) = ax(t) - b$ (D) $y(t) = x(t) + x(t - 1)$

82. A signal has a spectrum ranging from 0 to 15 kHz is to be sampled to be converted to discrete form. What is the minimum number of samples per second that must be taken to ensure recovery ?

(A) 7,500 samples /second (B) 30,000 samples /second
(C) 15,000 samples/second (D) 60,000 samples /second

83. Determine the fundamental period of the following signal :
$x(n) = 10\cos(0.2\pi n)$

(A) 10 (B) 5
(C) 15 (D) 20

84. A system is described by $T[x(n)] = g(n)\, x(n)$.
Which of the following is correct for the system ?

(A) Non-linear (B) Time invariant
(C) Memoryless (D) Non casual

85. Check the casuality and stability of the following system :
$h(n) = (0.5)^{|n|}$

(A) Non casual and BIBO stable (B) Casual and BIBO stable
(C) Casual and unstable (D) Non casual and unstable

86. A necessary and sufficient condition for BIBO stability of discrete time LTI system is that

(A) Magnitude of every root of its characteristic equation must be > 1
(B) Magnitude of every root of its characteristic equation must be < 1
(C) Magnitude of every root of its characteristic equation must be = 1
(D) Magnitude of every root of its characteristic equation must be ≥ 1

87. The system is linear if it is

(A) homogeneous (B) additive
(C) additive and homogeneous (D) time invariant

88. Aliasing occurs when
(A) $fs \geq 2fx$ (B) $fs = 2fx$
(C) $fs > 2fx$ (D) $fs < 2fx$

89. A signal $x(t) = \cos(3\pi t) + 2\cos(10\pi t)$ is ideally sampled. Find the maximum allowable interval between the samples.
(A) 5 seconds (B) 0.2 seconds
(C) 0.1 seconds (D) 10 seconds

90. An anti-aliasing filter is a
(A) High pass filter (B) Low pass filter
(C) Band pass filter (D) None of the above

91. Which of the following is a passive transducer ?
(A) Linear potentiometer (B) Thermocouple
(C) PV cell (D) Piezoelectric crystal

92. In LVDT, the secondary windings are connected in
(A) Parallel opposition (B) Series aiding
(C) Parallel aiding (D) Series opposition

93. Which of the following is a primary cell ?
(A) Zinc Carbon dry cell (B) Lead acid cell
(C) Nickel Cadmium cell (D) All the above

94. In series grouping of batteries, increase in the number of cells results in
(A) Increase in current (B) Constant current
(C) Decrease in current (D) Constant voltage

95. Due to moisture content in soil, the earth resistance
(A) increases (B) remains constant
(C) decreases (D) None of the above

96. The purpose of earthing is to
(A) provide a high resistance path to ground
(B) completely block the current to earth
(C) provide a low resistance path to earth
(D) None of the above

97. Which is the advantage of cleat wiring system ?
(A) Durable (B) Moisture proof
(C) Can be used for permanent wiring (D) Easy to locate fault in wiring

98. Which wiring method provides the best mechanical protection ?
(A) Cleat wiring (B) Metal conduit wiring
(C) Wooden casing and capping (D) TRS wiring

99. Candela is the unit of
(A) Illuminance (B) Luminous flux
(C) Luminous intensity of a source (D) Fluorescence

100. Which lamp shows stroboscopic effect ?
(A) Incandescent lamp (B) Fluorescent lamp
(C) Halogen lamp (D) All the above

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK