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GPSC
Asst. Engg.

Previous Year Paper
(Electrical)
29 Dec, 2024

BJY

PROVISIONAL ANSWER KEY

Name of the post	Assistant Engineer (Electrical), Class-2, Gandhinagar Municipal Corporation
Advertisement No.	31/2024-25
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Last Date to Send Suggestion (s)	21-01-2025

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Candidate must ensure compliance to the instructions mentioned below, else objections shall not be considered: -

(1) Candidates have to pay fees of Rs.100/- for each objection. The fees can be paid from the link given herewith.

(2) The Candidate will be able to submit objection only after payment of the fees. The generation of the receipt will only be considered as final submission.

(3) The Candidate must retain the receipt of the payment of the fees. The fees, once paid, will not be refunded under any circumstances.

(4) All the objections should be submitted through **ONLINE OBJECTION SUBMISSION SYSTEM** only. Physical or submission through any other means will not be considered.

(5) All objections are to be submitted with reference to the Master Question Paper published with provisional answer key, published herewith on the website / online objection submission system. Objections should be sent referring to the Question No. & options of the Master Question Paper. Objections regarding question nos. and options other than provisional answer key (Master Question Paper) shall not be considered.

(6) Objections and answers suggested by the candidate should be in compliance with the responses given by him in his answer sheet. Objections shall not be considered, in case, if responses given in the answer sheet /response sheet and submitted objections are differed.

(7) Supportive document to the objection must be uploaded, without which objection will not be considered.

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1. Given two continuous time signals $x(t) = e^{-t}$ and $y(t) = e^{-2t}$ which exist for $t > 0$, what is the convolution value of $z(t) = x(t) * y(t)$?

   (A) $e^{-t} + e^{-2t}$ (B) $e^{-t} - e^{-2t}$

   (C) e^{+t} (D) e^{-3t}

2. What should be the minimum sampling rate to avoid aliasing when a continuous time signal $x(t) = 5 \cos 400\pi t$ is to be discretized?

   (A) 100 Hz   (B) 250 Hz

   (C) 400 Hz   (D) 20 Hz

3. The process of converting analog signal into discrete form is called _____.

   (A) Sampling

   (B) Modulation

   (C) Quantization

   (D) Demultiplexing

4. What is the value of R in the circuit given below to transfer the maximum power from circuit A to circuit B, assuming both voltage sources in the figure below are in phase?
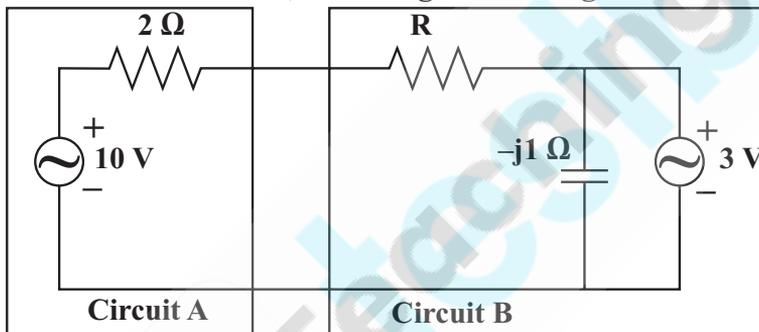

   (A) 2.0 Ω   (B) 1.2 Ω

   (C) 1.0 Ω   (D) 0.8 Ω

5. A network consists of only independent current sources and resistors. If the values of all the current sources are doubled, then what will be the values of node voltages?

   (A) will remain same.

   (B) will be halved.

   (C) will be doubled.

   (D) will change in some other way.

6. A certain current source has the values of current $I_s = 4\mu A$ and resistance $R_s = 1.2 M\Omega$. What are the values voltage V_s and resistance R_s of an equivalent voltage source?

   (A) 1 V, 1.2 MΩ   (B) 4.8 V, 1.2 MΩ

   (C) 4.8 μV, 1.2 MΩ   (D) 4.8 V, 4.8 MΩ

7. A voltage source of 18 V has an internal resistance of 70Ω. If a load resistance of 33Ω is connected to the voltage source, then what will be the load power P_L?

(A) 1 W

(B) 18 mW

(C) Zero

(D) 175 mW

8. What is the period of signal $x(t) = 8 \sin(0.8\pi t + \frac{\pi}{4})$?

(A) 0.8π s

(B) 2.5 s

(C) 0.4π s

(D) 1.25 s

9. A 680Ω load resistor (R_L) is connected across a constant current source of 1.2A having internal source resistance, R_s of 12 kΩ. What will be the load current I_L?

(A) Zero

(B) 1.2 A

(C) 0.766 A

(D) 1.14 A

10. Consider a star network in which three resistances R_a, R_b and R_c are connected to terminals A, B and C respectively. The resistance between terminals A and B with C open is 6 Ω, between B and C with A open is 11 Ω and between C and A with B open is 9 Ω. Then

(A) $R_a = 4Ω, R_b = 2Ω, R_c = 5Ω$

(B) $R_a = 3Ω, R_b = 3Ω, R_c = 4Ω$

(C) $R_a = 2Ω, R_b = 4Ω, R_c = 7Ω$

(D) $R_a = 5Ω, R_b = 1Ω, R_c = 10Ω$

11. If a square wave is integrated by an integrator using an Op-Amp circuit, then what will be the output signal waveform?

(A) Ramp

(B) Triangular wave

(C) Sine wave

(D) None of these

12. If a capacitor is placed in the feedback path of an Op-Amp Circuit, then the circuit can act as _____ .

(A) Integrator

(B) Multiplier

(C) Divider

(D) Subtractor

13. The Schmitt trigger circuit is a modification of which of the following multivibrators?

(A) Universal multivibrator

(B) Monostable multivibrator

(C) Bistable multivibrator

(D) Astable multivibrator

14. What will be the value of the Z_{12} parameter in the circuit given below?

    (A) 1Ω   (B) 2Ω

    (C) 3Ω   (D) 3.5Ω
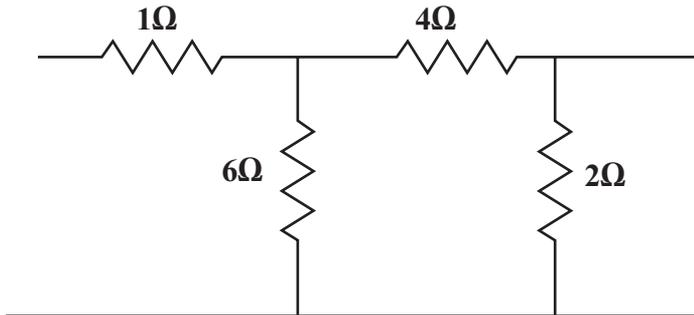
15. If a two-port network is reciprocal, which of the following relationship is correct?

    (A) $h_{12} = h_{21}$ (B) $h_{12} = -h_{21}$

    (C) $h_{22} = h_{11}$ (D) $h_{11} h_{22} - h_{12} h_{21} = 1$

16. F(s) is the Laplace transform of the function $f(t) = 2t^2 e^{-t}$, then F(1) is _____.

    (A) 2   (B) 1

    (C) 0.3   (D) 0.5

17. If a current of 5A flows through a resistor of 12Ω, then the power developed and the energy dissipated in 2 minutes are _____.

    (A) 380 W, 30000 J   (B) 300 W, 30000 J

    (C) 360 W, 30000 J   (D) 300 W, 36000 J

18. Specific resistance of a material is _____.

    (A) directly proportional to both the area of cross-section and length of material.

    (B) directly proportional to the area of cross-section and inversely proportional to the length of material.

    (C) inversely proportional to the area of cross-section and directly proportional to the length of material.

    (D) inversely proportional to the both area of cross-section and length of material.

19. An inductor of reactance 1Ω and resistance 2Ω is connected in series to the terminal of $6V_{rms}$ AC source. The power dissipated in the circuit is _____.

    (A) 4 W   (B) 8 W

    (C) 14.4 W   (D) 61.3 W

20. In an L-C-R circuit, alternating voltage (V) and current (I) are given by $V = V_0 \sin \omega t$ and $I = I_0 \sin (\omega t + \frac{\pi}{3})$. The average power dissipated in the circuit over a cycle is _____ .

    (A) $\dfrac{V_0 I_0}{4}$

    (B) $\dfrac{V_0 I_0}{2}$

    (C) Zero

    (D) $\dfrac{\sqrt{3}\, V_0 I_0}{4}$

21. What is maximum limit of earth leakage current (for single fault condition) as per International Standard IEC60601-1?

    (A) 2 mA

    (B) 1 mA

    (C) 1 A

    (D) 0.1 mA

22. Which size wire has the highest current carrying capacity?

    (A) 4 gauge

    (B) 10 gauge

    (C) 12 gauge

    (D) 18 gauge

23. Fuse is connected _____ .

    (A) in series with the circuit

    (B) in parallel with the circuit

    (C) either in series or parallel with the circuit

    (D) to bypass the load

24. A switchgear is a device used for _____ .

    (A) interrupting an electrical circuit

    (B) switching an electrical circuit

    (C) switching and controlling an electrical circuit

    (D) switching, controlling and protecting the electrical circuit and equipment

25. In a step-down transformer, the primary winding has _____ .

    (A) the same number of turns as the secondary

    (B) fewer turns than the secondary

    (C) more turns than the secondary

    (D) number of turns do not matter

26. The efficiency of a Power Transformer is _____ at full load.

    (A) same

    (B) minimum

    (C) maximum

    (D) fluctuates

27. Which of the following devices is typically used in DC-DC converters to control the output voltage?

    (A) Diode   (B) MOSFET

    (C) Transformer   (D) Resistor

28. What is the primary function of a power converter?

    (A) To increase voltage only

    (B) To convert electrical energy from one form to another

    (C) To store electrical energy

    (D) To decrease voltage only

29. What is the main advantage of using a synchronous motor over an induction motor?

    (A) Higher starting torque

    (B) Lowest Cost

    (C) Constant speed operation under varying loads

    (D) Simplicity in design

30. Which of the following machines operates on the principle of electromagnetic induction?

    (A) DC Generator   (B) Synchronous Motor

    (C) Induction Motor   (D) All of the above

31. In a transformer short circuit test, the current I_{sc} is _____.

    (A) equal to rated current

    (B) less than rated current

    (C) more than rated current

    (D) depends on transformer design

32. In winding design, the angle of chording (β) is nearly equal to _____.

    (A) 45 degree   (B) 30 degree

    (C) 60 degree   (D) 90 degree

33. Calculate the torque developed by a 3-phase, 400V, 50 Hz, 5 HP, 4-pole Induction Motor runs at 1500 rpm.

    (A) 23 N-m   (B) 21 N-m

    (C) 0 N-m   (D) 10 N-m

34. Auto-transformer starter gives the same effect as star/delta starter if its turn ratio is _____.

    (A) 0.33   (B) 0.66

    (C) 0.57   (D) 0.7

35. In an ideal transformer, no load primary current I_0 _____ .

   (A) lags behind V_1 by 90 degree   (B) leads V_1 by 90 degree

   (C) is in the phase with V_1 (D) lags V_1 by 45 degree

36. A T-T connection transformer cannot be operated in parallel with _____ transformer.

   (A) V-V   (B) Star-delta

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

37. The Transformer will operate at maximum efficiency when _____ .

   (A) hysteresis loss = eddy current loss

   (B) eddy current loss = copper loss

   (C) copper loss = iron loss

   (D) hysteresis loss = copper loss

38. In a transformer, if iron losses and copper losses are 40.5 kW and 50 kW respectively, then at what fraction of load will the efficiency be maximum?

   (A) 0.9   (B) 0.81

   (C) 0.66   (D) 0.5

39. A capacitor start and run Induction Motor has _____ as compared to capacitor start Induction Motor.

   (A) more over load capacity

   (B) good power factor and high efficiency

   (C) silent operation

   (D) all of these

40. A salient pole Synchronous Machine feeds from infinite bus & running at no load, and if its field current reduced to zero then motor would _____ .

   (A) stop

   (B) run at synchronous speed

   (C) run below synchronous speed

   (D) run above synchronous speed

41. An alternator generates power at 210 V per phase while running at 1500 rpm. What will be the generated voltage per phase, if the speed of the alternator drops to 1000 rpm?

   (A) 140 V   (B) 180 V

   (C) 210 V   (D) 105 V

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42. Two synchronous generators G_1 and G_2 are equally sharing the kVAR of the load while operating in parallel. Keeping the terminal voltage fixed, what should be done to shift part of the kVAR load from G_2 to G_1?

(A) The field current of G_1 is lowered

(B) The field current of G_2 is raised

(C) The field current of G_1 is raised and G_2 is lowered

(D) The field current of G_1 is lowered and G_2 is raised

43. The Potier's triangle separates _____.

(A) fixed losses and variable losses

(B) armature leakage reactance and armature reaction m.m.f.

(C) stator losses and rotor losses

(D) armature voltage and field voltage

44. Open circuit characteristic of DC generator is a plot of _____.

(A) load voltage Vs load current

(B) terminal voltage Vs load current

(C) terminal voltage Vs armature current

(D) no load voltage Vs field current

45. The condition for maximum mechanical power development in a DC motor is that back EMF is equal to _____.

(A) half the applied voltage

(B) same as the applied voltage

(C) twice the applied voltage

(D) does not depend on applied voltage

46. For a second order over damped system, the poles are _____.

(A) purely imaginary

(B) complex conjugate of each other

(C) real and equal

(D) real and unequal

47. The characteristic equation of a closed loop system is given by $s^4 + 6s^3 + 11s^2 + 6s + K = 0$. The range of values of gain K for stable operation of closed loop system is _____.

(A) $0 < K < 10$

(B) $10 < K < 20$

(C) $-\infty \leq K > \infty$

(D) $K > 10$

48. In a linear time invariant system, an input of 5 Sin ωt produces an output of 10 Cos ωt. What would be the output corresponding to an input of 10 Cos ωt?

(A) 5 Sin ωt

(B) 20 Sin ωt

(C) –5 Sin ωt

(D) –20 Sin ωt

[Contd.

49. As compared to a closed loop system, an open loop system is _____.

(A) Less stable but more accurate

(B) More stable but less accurate

(C) More stable and more accurate

(D) Less stable and less accurate

50. The transfer function of a closed loop control system is $\dfrac{2s^2 + 6s + 5}{(s + 1)^2\,(s + 2)}$. Then the characteristic equation of the system is given by _____.

(A) $2s^2 + 6s + 5 = 0$

(B) $2s^2 + 6s + 5 + (s + 1)^2\,(s + 2) = 0$

(C) $(s + 1)^2\,(s + 2) = 0$

(D) $2s^2 + 6s + 5 - (s + 1)^2\,(s + 2) = 0$

51. The root locus always starts at the _____.

(A) open loop poles   (B) open loop zeros

(C) closed loop poles   (D) closed loop zeros

52. Which of the following is used for Nyquist plot?

(A) Closed loop function.   (B) Damped function.

(C) Open loop function.   (D) Characteristic function.

53. Gain Margin is the reciprocal of the gain at the frequency at which the phase angle becomes _____.

(A) 180°   (B) 90°

(C) 0°   (D) 270°

54. Electrical time-constant of an armature-controlled DC servomotor is _____.

(A) equal to mechanical time-constant

(B) larger than mechanical time-constant

(C) not related to mechanical time-constant

(D) smaller than mechanical time-constant.

55. In a Force-Current analogy, the capacitance of electrical system is analogous to _____ of mechanical system.

(A) Velocity   (B) Mass

(C) Momentum   (D) Displacement

56. What is the formula for the force experienced by a charged particle in an electric field?

    (A) F = qE   (B) F = qB

    (C) F = q / E   (D) F = q / B

57. The divergence of a magnetic field in a region with no current is _____.

    (A) Zero   (B) Constant

    (C) Non-zero and constant   (D) Variable

58. The energy stored in an electromagnetic field is given by which of the following?

    (A) $\frac{1}{2}\varepsilon E^2$ (B) $\frac{1}{2}\mu H^2$

    (C) Both A and B   (D) None of the above

59. The Poynting vector represents _____.

    (A) The direction of the electric field

    (B) The direction of the magnetic field

    (C) The power flow per unit area

    (D) The electric potential

60. What does Gauss's law for electricity state?

    (A) The total electric flux through a closed surface is proportional to the enclosed electric charge

    (B) The total magnetic flux through a closed surface is zero

    (C) The electric field in free space is always zero

    (D) None of the above

61. Which law explains the relationship between electric current and magnetic field?

    (A) Faraday's Law   (B) Coulomb's Law

    (C) Lenz's Law   (D) Ampere's Circuital Law

62. Which of the following is a non-periodic signal?

    (A) Sinusoidal signal   (B) Exponential signal

    (C) Triangular signal   (D) Square wave signal

63. The Fourier Series is used for _____.

    (A) converting continuous to discrete signals

    (B) analyzing non-periodic signals

    (C) analyzing periodic signals

    (D) filtering noise from signals

64. In signal processing, the Nyquist rate refers to _____.

   (A) twice the highest frequency present in the signal

   (B) the maximum sampling rate

   (C) the average sampling rate

   (D) the minimum sampling rate

65. A signal x(n) is periodic if _____.

   (A) x(n) = x(n – N) for all integer N

   (B) x(n) = x(n + N) for all integer N

   (C) x(n) = x(n – 1)

   (D) x(n) = x(n + 1)

66. Which Maxwell equation indicates that magnetic fields can be generated by changing electric fields?

   (A) Faraday's Law of Induction

   (B) Gauss's Law for Magnetism

   (C) Ampere's Circuital Law (with Maxwell's addition)

   (D) Gauss's Law for Electricity

67. What is the z transform of signal $x[n] = a^n u[n]$

   (A) $\dfrac{1}{1 - az}$

   (B) $\dfrac{z}{z - a}$

   (C) $\dfrac{1}{1 - a^z}$

   (D) $\dfrac{1}{1 - az^{-1}}$

68. What does the term 'impulse response' refer to in signal processing?

   (A) The response to a sinusoidal input

   (B) The response to exponential input

   (C) The response to a delta input

   (D) The response to a step input

69. Which of the following represents the Fourier Transform of a rectangular pulse of duration T?

   (A) $\dfrac{1}{T}$

   (B) T.Sinc (fT)

   (C) Sinc (T)

   (D) T.Sinc (πfT)

70. Which signal is obtained by sampling a continuous-time signal?

   (A) Discrete-time signal

   (B) Analog signal

   (C) Continuous-time signal

   (D) Digital signal

71. **What is the factor deciding the thickness of conductor insulation?**

    (A) Voltage rating   (B) Current rating

    (C) Power rating   (D) Frequency rating

72. **What is the unit to express the rating of fuse wire?**

    (A) Volt   (B) Ampere

    (C) Watt   (D) kWh

73. **The fusing current for a round wire is proportional to (diameter)^k, where the value of k is _____.**

    (A) 1   (B) –1

    (C) 0.5   (D) 1.5

74. **A circuit feeding single-phase motor should use _____.**

    (A) One fuse in phase and no fuse in neutral

    (B) One fuse in phase and one fuse in neutral

    (C) No fuse in phase and no fuse in neutral

    (D) No fuse in phase and one fuse in neutral

75. **As per the National Electrical Code of India 2023, the following graphical symbol represents _____.**

    (A) electric charging point   (B) electric charging station

    (C) electric vehicle parking shed   (D) electric vehicle service station

76. **For installation design as per the National Electrical Code of India 2023, what is the range of voltage between which the system of 415 V shall be capable of operating continuously?**

    (A) 405 V – 425 V   (B) 394 V – 436 V

    (C) 384 V – 446 V   (D) 374 V – 457 V

77. **Which of the following equipment are likely to cause harmonic current?**

    (A) Fluorescent and LED luminaries

    (B) Variable Voltage Variable Frequency (VVVF) drives

    (C) Inverter based air conditioners, washing machines and refrigerators

    (D) All of the above

78. Besides the requirement of estimated maximum load current under normal conditions, what other factor is/are considered while selecting the cross-sectional areas of conductor?

(A) fault level withstand capacity

(B) allowable voltage-drop

(C) harmonic disturbances

(D) All of the above

79. As per the National Electrical Code of India 2023, the nominal cross-section area of phase conductors of copper in AC circuits feeding 6A lighting point and 16A power point shall not be less than _____ .

(A) 0.5 mm^2 and 1.5 mm^2 respectively

(B) 1 mm^2 and 2 mm^2 respectively

(C) 1.5 mm^2 and 2.5 mm^2 respectively

(D) 2 mm^2 and 3 mm^2 respectively

80. Which of the following is a function of powdered quartz filled in HRC fuse cartridge?

(A) To help as a timer when the fusible element melts

(B) To help to form a semiconductor

(C) To help in quenching the arc

(D) To make the fuse more transparent

81. The service value of a ceiling fan is measured in _____ .

(A) mm/min/Wh

(B) m^3/mm/Wh

(C) m^3/min/W

(D) mm/min/W

82. Which of the following types of residual current device can detect a residual current containing the components of frequencies higher than 50Hz, the non-sinusoidal waveshapes, the waveshapes resulting from rectifying circuits with six diodes bridge, as well as smooth DC?

(A) RCD Type A

(B) RCD Type B

(C) RCD Type AC

(D) RCD Type F

83. Which of the following factors determine the severity of the shock?

(A) The magnitude of the current

(B) The parts of the body through which the current flows

(C) The duration of the current flow

(D) All of the above

84. Long and hard shadows in lighting system design can be avoided by _____ .

    (A) using wide surface sources of light

    (B) using indirect lighting

    (C) using proper mounting heights of lamp

    (D) all of the above

85. The illumination on the surface 1 meter away from the source of light is 36 lux. What must be the illumination on a surface 2 meter away from the same source?

    (A) 9 lux   (B) 18 lux

    (C) 36 lux   (D) 72 lux

86. A consumer always draws power at 0.8 lagging power factor. What kind of tariff will not motivate the consumer for power factor improvement?

    (A) kVAh billing   (B) kWh + kVArh billing

    (C) kWh billing   (D) none of the above

87. What is the effect of lagging low power factor and leading low power factor on the voltage at the point of application?

    (A) Decreased voltage & decreased voltage respectively

    (B) Decreased voltage & increased voltage respectively

    (C) Increased voltage & decreased voltage respectively

    (D) Increased voltage & increased voltage respectively

88. Which of the following methods offers a flexible, scalable solution for harmonic mitigation?

    (A) Use of reactors

    (B) Use of active harmonic filters

    (C) Use of passive harmonic filters

    (D) Use of transformers with special connections

89. Normally, where is the location of point of common coupling (PCC) between electricity supplier and consumer of the following type?

    (i) industrial user supplied via a dedicated service transformer

    (ii) commercial users e.g. office parks, malls, supplied via a common service transformer

    (A) (i) HV side of transformer; (ii) HV side of transformer

    (B) (i) HV side of transformer; (ii) LV side of transformer

    (C) (i) LV side of transformer; (ii) LV side of transformer

    (D) (i) LV side of transformer; (ii) HV side of transformer

90. Under what condition, the switching of electric supply may be required?

    (A) no load condition
    (B) normal load condition
    (C) fault condition
    (D) all of the above

91. What is the minimum resistance offered by a human body?

    (A) 10Ω
    (B) 100Ω
    (C) 1 kΩ
    (D) 1 MΩ

92. If the velocity of wind is doubled, then the power output of a horizontal axis wind-turbine generator will _____.

    (A) increase by 2 times
    (B) increase by 4 times
    (C) increase by 6 times
    (D) increase by 8 times

93. What is full form of GTO in the context of thyristor classification?

    (A) Gate turn-off Thyristor
    (B) Gate trigger-on Thyristor
    (C) Gate testing-on Thyristor
    (D) Gate turn-on Thyristor

94. The Triac is equivalent to _____.

    (A) two SCRs connected in parallel
    (B) two SCRs connected in anti-parallel
    (C) one SCR, one diode connected in parallel
    (D) one SCR, one diode connected in anti-parallel

95. The Holding current of a thyristor is _____.

    (A) equal to its latching current.
    (B) more than its latching current.
    (C) less than its latching current.
    (D) either more or less; no relation exists between holding current and latching current.

96. A single-phase, phase-controlled rectifier has a freewheeling diode across the load. The freewheeling diode can be considered ideal. The instantaneous output voltage across the load _____.

    (A) is always positive
    (B) may be positive or zero
    (C) may be positive, negative or zero
    (D) may be negative or zero

97. D flip-flop is said to be transparent when _____.

    (A) the output is high
    (B) the output follows the clock
    (C) the output follows the input
    (D) the output is low

98. What is the decimal equivalent of binary number 10101?

    (A) 12   (B) 19

    (C) 21   (D) 27

99. Which ADC (Analog to Digital Convertor) is slowest?

    (A) Parallel comparator type

    (B) Successive approximation type

    (C) Integrating type

    (D) Counting type

100. A constant load is fed from a constant DC source via an SCR. After triggering the SCR, the gate pulse is removed. The current in the SCR will _____.

    (A) remain the same

    (B) immediately fall to zero

    (C) slightly reduce

    (D) initially increase and then fall to zero

101. In which of the following cases of speed control of induction motor drives, the V/f ratio is maintained constant?

    (A) Below base speed with voltage control

    (B) Below base speed with frequency control

    (C) Above base speed with frequency control

    (D) None of the above

102. Which of the following speed control techniques is not applicable in squirrel cage induction motor drives?

    (A) Stator voltage control   (B) Supply frequency control

    (C) Pole changing   (D) Slip power recovery

103. In a single-phase full bridge, single-pulse modulation of PWM inverters, the pulse width is 120°. What is RMS value of output AC voltage, if input DC voltage is 220 V?

    (A) 179.63 V   (B) 254.04 V

    (C) 127.02 V   (D) 185.04 V

104. Choose the correct statement regarding the power semiconductor device.

    (A) Both BJT and MOSFET are voltage controlled devices

    (B) MOSFET is voltage controlled device, BJT is current controlled device

    (C) MOSFET is current controlled device, BJT is voltage controlled device

    (D) Both BJT and MOSFET are current controlled devices

105. The number of distinct Boolean expression of 4 variables is _____.
     (A) 16   (B) 256
     (C) 1024   (D) 65536

106. The complete set of only those Logic Gates designated as Universal Gates is _____.
     (A) NOT, OR and AND Gates
     (B) XNOR, NOR and NAND Gates
     (C) NOR and NAND Gates
     (D) XOR, NOR and NAND Gates

107. Which of the following circuits are classified as combinational logic circuits?
     1. Full adder   2. Full subtracter   3. Half adder   4. J-K flip-flop   5. Counter
     (A) 1 only   (B) 3 and 4
     (C) 4 and 5   (D) 1, 2 and 3

108. What is the role of AC grid-tied inverter in solar PV generation system?
     (A) converts AC to DC and feeds the power from grid to solar panel
     (B) converts DC to AC and feeds the power from grid to solar panel
     (C) converts DC to AC and feeds the power from solar panel to grid
     (D) converts AC to DC and feeds the power from solar panel to grid

109. Which among the following is not attainable shunt VAr compensator?
     (A) Thyristor switched reactor
     (B) Thyristor controlled reactor
     (C) Thyristor switched capacitor
     (D) Thyristor controlled capacitor

110. In a sine PWM controlled inverter, the magnitude of output AC voltage is determined by _____.
     (A) switching frequency
     (B) frequency of reference signal
     (C) amplitude modulation index
     (D) load power factor

111. A power MOSFET having turn-on delay time, rise time, turn-off delay time, and fall time of 100 ns (nano seconds) each, cannot be operated at which of the following switching frequencies?
     (A) 3 kHz   (B) 30 kHz
     (C) 300 kHz   (D) 3000 kHz

112. Freewheeling diode at the output of a rectifier allows _____.
    (A) SCR to trigger properly
    (B) turn-off SCR at the end of half cycle
    (C) protection of SCR against over voltage
    (D) None of the above

113. In the following K-map, the input variables are A, B and C. What is the simplified Boolean expression for output variable Y in terms of the input variables?

A \ BC	00	01	11	10
0	0	0	1	0
1	0	1	1	1

    (A) Y = AB + BC + CA
    (B) Y = ABC + BC
    (C) Y = ABC + CA
    (D) Y = BC + CA

114. The flow of information on data bus and address bus is _____ respectively.
    (A) unidirectional and unidirectional
    (B) bidirectional and unidirectional
    (C) unidirectional and bidirectional
    (D) bidirectional and bidirectional

115. The size of Accumulator, Register B, PC, DPTR and PSW in 8051 microcontroller are _____ bits respectively.
    (A) 8, 8, 16, 16, 8   (B) 8, 16, 16, 16, 8
    (C) 8, 8, 16, 16, 16   (D) 8, 8, 16, 8, 8

116. The 8051 microcontroller has 128 bytes of internal RAM out of which _____ bytes of memory can be addressed at the bit level.
    (A) 4   (B) 8
    (C) 16   (D) 128

117. Which of the following flags of 8051 microcontroller cannot be set or cleared by the programmer at will?
    (A) General purpose flags   (B) C and AC
   (C) P and OV   (D) None of the above

118. **The SP is set to _____ when the 8051 microcontroller is reset.**
    (A) 06h
    (B) 07h
    (C) 08h
    (D) 09h

119. **Which pin of port 3 of 8051 microcontroller has an alternative function as write control signal for external data memory?**
    (A) P3.4
    (B) P3.5
    (C) P3.6
    (D) P3.7

120. **What is the function of EA pin in 8051 microcontroller?**
    (A) enable/disable external memory interfacing
    (B) latch address and data bus
    (C) provide power supply
    (D) provide clock signal

121. **Among the following interrupts of 8051 microcontroller, which one has higher priority?**
    (A) Timer Flag Interrupt
    (B) External Interrupt
    (C) Reset
    (D) Serial Port Interrupt

122. **What is the destination of serial interrupt in 8051 microcontroller?**
    (A) 0003h
    (B) 0013h
    (C) 0023h
    (D) 0033h

123. **What will be the contents of A after execution of the following set of instructions?**
    MOV A, #0FFh
    MOV R0, #77h
    ANL A, R0
    (A) 00h
    (B) 77h
    (C) 88h
    (D) FFh

124. **What will be the contents of A after execution of the following set of instructions?**
    MOV A, #0A5h
    RR A
    RR A
    (A) A5h
    (B) D2h
    (C) 69h
    (D) B4h

125. The capacity of a battery cell is measured in _____.

    (A) Watt-hour   (B) Watt

    (C) Ampere   (D) Ampere-hour
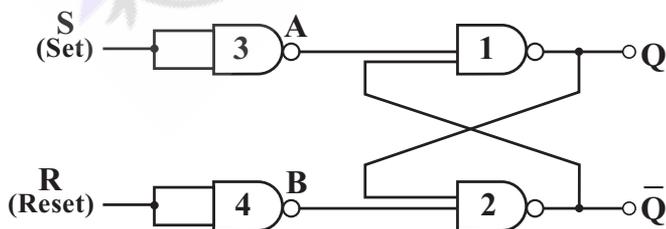
126. Trickle charging of a storage battery helps to _____.

    (A) prevent sulphation

    (B) maintain proper electrolyte level

    (C) keep it fully charged

    (D) increase its reserve capacity

127. The logic diagram of a 4-to-1 line multiplexer is shown below. What combination of select inputs $S_1 - S_0$ will result in rejection of inputs D_0, D_1 and D_3?
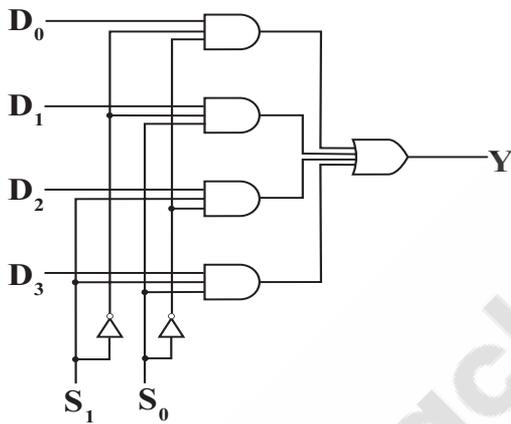
    (A) 00

    (B) 01

    (C) 10

    (D) 11

128. What is the output of the SR-Latch shown below, if the inputs are changed from (S = 1; R = 0) to (S = 0; R = 0)?

    (A) Q = 1; Q' = 0   (B) Q = 0; Q' = 1

    (C) Q = 0; Q' = 0   (D) Output is undefined

                                                    [Contd.

129. The output of the JK flip-flop shown below was Q = 1; Q' = 0. Now if the inputs are set as J = 1; K = 0, what is the new output?

(A) Q = 1; Q' = 0 (B) Q = 0; Q' = 1

(C) Q = 0; Q' = 0 (D) Output is undefined

130. A read/write memory (RAM) chip has 13 address lines. The first seven address lines are connected to the column decoder and the remaining six address lines are connected to the row decoder. How many memory cells can be addressed using such organization?

(A) 2048 (B) 4096

(C) 8192 (D) 16384

131. For fixed value of complex power flow in a transmission line having sending end voltage V, the real power loss will be proportional to _____.

(A) V (B) V^2

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

132. For a lossless network, more maximum power transfer capability is possible with _____.

(A) low GMR (Geometric Mean Radius), high GMD (Geometric Mean Distance)

(B) low GMR (Geometric Mean Radius), low GMD (Geometric Mean Distance)

(C) high GMR (Geometric Mean Radius), low GMD (Geometric Mean Distance)

(D) No relation between GMR (Geometric Mean Radius), GMD (Geometric Mean Distance) and maximum power transfer

133. For enhancing the power transmission in a long EHV transmission line, the most preferred method is to connect a _____.

(A) series inductive compensator in the line

(B) shunt inductive compensator at the receiving end

(C) series capacitive compensator in the line

(D) shunt capacitive compensator at the receiving end

134. In a transmission line, both sending end and receiving end voltages are maintained at same magnitude and there is a real power flow from sending end to receiving end. The reactive power flow will be _____.

(A) delivered by both buses into the line

(B) absorbed by both buses from the line

(C) delivered by sending end bus

(D) no reactive power flow between buses

135. If we increase the height of transmission line above ground, what will be the effect on power transmission capability and charging current?

(A) Both will decrease

(B) Will increase and decrease

(C) Power will remain same and charging current will decrease

(D) Both will remain unaffected

136. Total Instantaneous power supplied by three phase AC supply to balanced RL load is _____.

(A) Zero   (B) Constant

(C) Pulsating with zero average   (D) Pulsating with non-zero average

137. If the phase conductor of a three phase line are not magnetically coupled, then the positive, negative and zero sequence of line follows as _____.

(A) $Z_1 = Z_2 < Z_0$ (B) $Z_1 < Z_2 < Z_0$

(C) $Z_1 < Z_2 = Z_0$ (D) $Z_1 = Z_2 = Z_0$

138. A balanced three phase power system consists of _____.

(A) zero sequence current only

(B) positive sequence current only

(C) negative and zero sequence currents

(D) positive, negative and zero sequence currents

139. The rated voltage of a three phase power system is given as _____.

(A) RMS phase voltage   (B) Peak Phase voltage

(C) RMS line to line voltage   (D) Peak line to line voltage

140. A Buchholz relay is used for _____.

(A) protection of transformer against all internal faults

(B) protection of transformer against all external faults

(C) protection of transformer against both internal and external faults

(D) protection of induction motors

141. A lossless transmission line has a characteristic impedance of Z_0 and capacitance per unit length of C. The velocity propagation of the travelling wave on the line is _____.

(A) C / Z_0

(B) Z_0 / C

(C) $1 / Z_0 C$

(D) $Z_0 C$

142. The transmission line distance protection relay having the property of being inherently directional is _____.

(A) Impedance relay

(B) MHO relay

(C) OHM relay

(D) Reactance relay

143. Resistance switching is normally employed in _____.

(A) All breakers

(B) Bulk oil breakers

(C) Minimum oil breakers

(D) Air blast circuit breakers

144. The symmetrical components are used in the fault analysis because _____.

(A) the sequence of networks does not have mutual couplings

(B) the number of equations become smaller

(C) the results are required in terms of symmetrical components

(D) none of above

145. In a biased differential relay, the bias is defined as a ratio of _____.

(A) operating coil current and restraining coil current.

(B) number of turns of restraining and operating coils.

(C) fault current and operating coil current.

(D) fault current and restraining coil current.

146. A power station has a maximum demand of 15,000 kW. The annual load factor is 50% and plant capacity factor is 40%. The reserve capacity of the plant is _____.

(A) 5000 MW

(B) 1241 kW

(C) 4800 MW

(D) 3750 kW

147. In load flow analysis, the load connected at a bus is represented as _____.

(A) Constant current drawn from the bus

(B) Constant impedance connected at the bus

(C) Voltage and frequency dependent source at the bus

(D) Constant real and reactive power drawn from the bus

148. In case of transmission line, AC resistance is more than DC resistance due to _____.
(A) Ferranti effect
(B) Skin effect
(C) Proximity effect
(D) Both (B) & (C)

149. A transmission line has a conductor radius r = 1 cm, produces an internal inductance Lint = 0.05 mH/km. If the size of the conductor is doubled, then its Lint is _____.
(A) 0. 1 mH/km
(B) 0. 05 mH/km
(C) 0.025 mH/km
(D) 0

150. Steady state stability of a power system is the ability of the power system to _____.
(A) Maintain voltage at the rated voltage level
(B) Maintain frequency exactly at 50 Hz
(C) Maintain a spinning reserve margin at all times
(D) Maintain synchronism between machines and external tie lines

151. The primary purpose of transferring the power at higher voltage is _____.
(A) to reduce transmission loss
(B) to increase the area of cross-section of conductor
(C) to decrease number of insulators in a string
(D) none of these

152. The insulation level of a 400 kV, EHV overhead transmission line is decided on the basis of _____.
(A) Switching overvoltage
(B) Lightning overvoltage
(C) Radio and TV interference
(D) Corona inception voltage

153. The impedance value of a generator is 0.2 pu on a base value of 11 kV, 50 MVA. The impedance value for a base value of 22 kV, 150 MVA is
(A) 0.15 pu
(B) 0.2 pu
(C) 0.3 pu
(D) 0.4 pu

154. For a fault at synchronous generator terminal, the fault current is maximum for a _____.
(A) Line-to-Line fault
(B) Line-to-Ground fault
(C) Three Phase-to-Ground fault
(D) Three Phase fault

155. In swing equation of a synchronous generator, the angle δ represents _____.

   (A) angular displacement of the stator mmf with respect to a synchronously rotating axis.

   (B) angular displacement of an axis fixed to the rotor with respect to a synchronously rotating axis.

   (C) angular displacement of the rotor with respect to the stator.

   (D) angle between stator voltage and current

156. For which type of fault protection, reactance relay is normally preferred _____ .

   (A) Earth faults   (B) Phase faults

   (C) Open-circuit faults   (D) None of these

157. A negative sequence relay is commonly used to protect _____.

   (A) a transmission line   (B) a bus bar

   (C) a transformer   (D) an alternator

158. The interrupting time of a circuit breaker is the period between the instant of _____.

   (A) energizing of the trip circuit and the parting of primary arc contacts.

   (B) energizing of the trip circuit and the arc extinction on an opening operation.

   (C) initiation of short circuit and the arc extinction on an opening operation.

   (D) initiation of short circuit and the parting of primary arc contacts

159. The chances of arc interruption in subsequent current zero _____.

   (A) increases in case of Oil Circuit Breaker

   (B) decreases in case of Oil Circuit Breaker

   (C) interruption is always at first current zero (in Oil Circuit Breaker)

   (D) none of the above

160. In the protection of transformers, harmonic restraint is used to guard against _____.

   (A) magnetizing inrush current   (B) unbalanced operation

   (C) lightning   (D) switching overvoltage

161. The non-uniform distribution of voltage across the units in a string of suspension type insulators is due to _____.

   (A) unequal self-capacitance of the units

   (B) non-uniform distance of separation of the units from the tower body

   (C) the existence of stray capacitance between the metallic junctions of the units and the tower body

   (D) non-uniform distance between the cross-arm and the units

162. For transmission line operating at 400 kV, which of the following insulator is used?

(A) Pin type

(B) Suspension type

(C) The combination of (A) & (B) above

(D) None of the above

163. When a line-to-ground fault occurs, the current in a faulted phase is 100 A. The zero sequence current in this case will be _____.

(A) Zero

(B) 33.3 A

(C) 66.6 A

(D) 100 A

164. A power system is subjected to a fault which makes the zero sequence component of current equal to zero. The nature of the fault is _____.

(A) Double line to Ground fault

(B) Double line fault

(C) Line to Ground fault

(D) Three-phase to Ground fault

165. The reflection coefficient of a short-circuited line is _____.

(A) –1

(B) +1

(C) 0.5

(D) 0

166. The charging current in a transmission line increases due to corona effect because corona increases the _____.

(A) line current

(B) effective line voltage

(C) effective conductor diameter

(D) all of the above are correct

167. A power system network with a capacity of 100 MVA has a source impedance of 10% MVA at a point. The fault level at that point is _____.

(A) 10 MVA

(B) 30 MVA

(C) 3000 MVA

(D) 1000 MVA

168. If the reference bus is changed in two load flow runs with same system data and power obtained for reference bus taken as specified P and Q in the latter run _____.

(A) The system losses will change but the complex bus voltages will remain unchanged.

(B) The system losses will be unchanged but the complex bus voltages will change.

(C) The system losses as well as the complex bus voltages will change.

(D) The system losses as well as the complex bus voltages will be unchanged.

169. In a 80 bus power system, there are 10 generators. In a particular iteration of Newton-Raphson load flow technique (in polar coordinates), two of the PV buses are converted to PQ type. In this iteration _____.

    (A) The number of unknown voltage angles increases by two and the number of unknown voltage magnitudes increases by two.

    (B) The number of unknown voltage angles remains unchanged and the number of unknown voltage magnitudes increases by two.

    (C) The number of unknown voltage angles increases by two and the number of unknown voltage magnitudes decreases by two.

    (D) The number of unknown voltage angles remains unchanged and the number of unknown voltage magnitudes decreases by two.

170. In Thyristor based HVDC link _____.

    (A) Rectifier station consumes reactive power and Inverter station supplies reactive power

    (B) Both Rectifier and Inverter station supply reactive power

    (C) Both Rectifier and Inverter station consume reactive power

    (D) Rectifier station supplies reactive power and Inverter station consumes reactive power

171. HVDC transmission is preferred to EHV-AC because _____.

    (A) HVDC terminals are inexpensive.

    (B) VAR compensation is not required in HVDC system.

    (C) system stability can be improved.

    (D) harmonics problem is avoided.

172. Power carrying capability (P) of HVDC transmission line with distance (d) varies as _____.

    (A) $P \propto d$

    (B) $P \propto \dfrac{1}{d^2}$

    (C) $P \propto \dfrac{1}{d}$

    (D) Independent of d

173. HVDC transmission is essential in the following case of interconnection of system with _____.

    (A) Different frequencies

    (B) Short distance transmission

    (C) Medium distance transmission

    (D) Long distance transmission

174. In HVDC transmission system, rectifier firing angle is kept near _____.

    (A) 0°

    (B) 15°

    (C) 30°

    (D) 90°

175. Large number of thyristors are connected in series in HVDC converter station due to _____.
   (A) Voltage ratings of thyristors are low
   (B) Current ratings of thyristors are low
   (C) Thyristor always fails in an internal open circuit
   (D) Voltage ratings of thyristors are high

176. The load-frequency characteristic of a generation unit is a _____.
   (A) straight line having positive slope
   (B) straight line having negative slope
   (C) straight line with zero slope
   (D) parabola with positive slope

177. The main purpose of energy conservation is to _____.
   (A) increase energy production
   (B) reduce energy consumption
   (C) maintain constant energy use
   (D) increase power generation

178. Which of the following is an example of energy-efficient lighting?
   (A) Incandescent bulb   (B) Fluorescent lamp
   (C) LED lamp   (D) Halogen lamp

179. In order to have a lower cost of electrical energy generation, _____.
   (A) the load factor and diversity factor should be low
   (B) the load factor should be low but diversity factor should be high
   (C) the load factor should be high but diversity factor should be low
   (D) the load factor and diversity factor should be high

180. What device can be used to reduce energy consumption in electric motors?
   (A) Variable Speed Drive (VSD)   (B) Transformer
   (C) Capacitor   (D) Fuse

181. Which international organization publishes the World Energy Outlook?
   (A) World Bank   (B) United Nations
   (C) OPEC   (D) International Energy Agency (IEA)

182. What is the target year set by many countries to achieve net-zero carbon emissions as per the Paris Agreement?
   (A) 2030   (B) 2040
   (C) 2050   (D) 2060

183. What is the main purpose of energy banking in a grid system?

   (A) To sell surplus energy at a premium

   (B) To reduce grid stability

   (C) To allow producers to store excess energy generated during low demand and retrieve it when needed

   (D) To generate additional profits for consumers

184. Which of the following is the largest source of renewable energy in the world?

   (A) Wind energy
   (B) Hydropower
   (C) Geothermal energy
   (D) Biomass energy

185. What is the role of the Bureau of Energy Efficiency in India?

   (A) To develop policies for energy conservation

   (B) To manage the transmission of energy

   (C) To provide financial aid for power generation

   (D) To monitor energy consumption

186. The star rating label on electrical appliances in India is issued by _____.

   (A) Ministry of New and Renewable Energy (MNRE)

   (B) Bureau of Energy Efficiency (BEE)

   (C) Central Electricity Regulatory Commission (CERC)

   (D) State Electricity Boards (SEBs)

187. In three phase system, the phasor sum of current is zero. Then there will be no _____.

   (A) Positive sequence component

   (B) Negative sequence component

   (C) Zero sequence component

   (D) None of the above

188. Which material is used in controlling chain reaction in a nuclear power plant?

   (A) Thorium
   (B) Heavy Water
   (C) Boron
   (D) Beryllium

189. For harnessing low variable water heads, the suitable hydraulic turbine with high percentage of reaction and runner adjustable vanes is _____.

   (A) Kaplan
   (B) Francis
   (C) Pelton
   (D) Impeller

190. In a Line Commutated Converter based HVDC, the reversal of power can be done by _____.

    (A) Reversing the polarity of DC Voltage

    (B) Reversing the DC current direction

    (C) Both (A) and (B)

    (D) It is not possible to reverse power in Line Commutated Converter based HVDC

191. Which types of waste are covered under the Gujarat Waste to Energy Policy 2022?

    (A) Only industrial waste

    (B) Only agricultural waste

    (C) Municipal solid waste (MSW), agricultural and industrial waste

    (D) Only medical waste

192. Under the Electricity Act, 2003, the Central Electricity Authority (CEA) is primarily responsible for _____.

    (A) Technical standards and safety regulations

    (B) Tariff determination

    (C) Regulation of the electricity market

    (D) Issuing licences to consumers

193. What is the role of State Electricity Regulatory Commissions (SERCs) under the Electricity Act, 2003?

    (A) To generate electricity

    (B) To approve tariffs and ensure fair competition

    (C) To manage the national grid

    (D) To enforce coal regulations

194. In a bipolar Line Commutated Converter Based HVDC system _____.

    (A) both conductors are at positive potential with respect to ground

    (B) both conductors are at negative potential with respect to ground

    (C) one conductor at positive potential and the other at negative potential with respect to ground

    (D) one conductor is at positive or negative potential with respect to ground and the other conductor is at ground potential

195. The chances of commutation failure in Line Commutated HVDC systems are more at _____.

    (A) Rectifier station

    (B) Inverter station

    (C) Equal chances at both rectifier and inverter stations

    (D) There are no possibilities of commutation failure

196. Which of the following is NOT a provision of the Gujarat Electricity Industry (Reorganization & Regulation) Act, 2003?

    (A) Open access to transmission networks

    (B) Establishment of a State Electricity Board

    (C) Tariff determination by the regulatory commission

    (D) Promotion of renewable energy sources

197. Which of the following is a key function of the Electricity Regulatory Commission (ERC)?

    (A) Building power plants

    (B) Setting tariffs for generation, transmission and distribution

    (C) Selling electricity to consumers

    (D) Maintaining power distribution networks

198. The term "Multi-Year Tariff" (MYT) refers to _____.

    (A) A tariff that changes annually

    (B) A tariff that applies to multiple sectors

    (C) A framework where tariffs are set for multiple years to avoid frequent changes

    (D) A fixed tariff for a year only

199. Which of the following describes a "tariff petition"?

    (A) A request by a consumer to lower their electricity bill

    (B) A legal document to start electricity distribution in a new area

    (C) A government order mandating new tariffs

    (D) A proposal by an electricity company to adjust tariffs

200. What is the maximum capacity (in MW) of a hydropower project classified as "Small Hydel" under the Gujarat Small Hydel Policy-2016?

    (A) 25 MW   (B) 50 MW

    (C) 100 MW   (D) 150 MW

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