COMBINED TECHNICAL SERVICES EXAMINATION

(DIPLOMA / ITI LEVEL)

COMPUTER BASED TEST

DATE OF EXAM: 15.11.2024 AN

PAPER – II – INSTRUMENTATION ENGINEERING

(DIPLOMA STANDARD) (CODE: 448)

1. The principal ions involved with the phenomena of producing cell potentials are

    1. Na^+

    2. K^+

    3. Cl^-

    4. Mg

    (A) 1 and 2 only   (B) 2 and 3 only

    (C) 3 and 4 only   (D) 1, 2 and 3 only

    (E) Answer not known

2. Korotkoff Sounds are observed during measuring the

    (A) Speed of Wind flow   (B) Blood Pressure

    (C) Electrical Insulation   (D) Atmospheric Pressure

    (E) Answer not known

3. In displacement method of respiration rate measurement, which type of transducer used to measure displacement is

    (A) Potentiometer   (B) LVDT

    (C) Strain Gauge   (D) Capacitive Transducer

    (E) Answer not known

4. Action potential is a

    (A) Bio accoustic signal   (B) Bio chemical signal

    (C) Bio electric signal   (D) Bio mechanical signal

    (E) Answer not known

5. Needle electrodes is used to measures

(A) ECG   (B) EEG

(C) EMG   (D) ERG

(E) Answer not known

6. Natural pacemaker in the human body is called

(A) Sino-Atrial node   (B) Atrio-Sinusoidal node

(C) Cardiac Pacemaker   (D) Internal Pacemaker

(E) Answer not known

7. The defibrillator placed at public place, to be accessed by the public is

(A) External Defibrillator

(B) Internal Defibrillator

(C) Automated External Defibrillator (AED)

(D) Automated Internal Defibrillator (AID)

(E) Answer not known

8. The cut off frequency of high pass filter used in EMG machine is

(A) 50 Hz   (B) 100 Hz

(C) 1000 Hz   (D) 1500 Hz

(E) Answer not known

9. During the recording of EEG, 10/20 Electrode placement system, number of Electrodes placed is

(A) 11   (B) 16

(C) 21   (D) 23

(E) Answer not known

10. Role of a ventilator is

   (A) To supply Oxygen to Patients
   (B) To measure blood pressure
   (C) To providing artificial ventilation of the lungs
   (D) To remove excess water from blood
   (E) Answer not known

11. The audible range of frequency for human ear is

   (A) 20 Hz to 20 kHz   (B) 20 kHz to 200 kHz
   (C) 20 Hz to 200 Hz   (D) 200 Hz to 2 kHz
   (E) Answer not known

12. A Typical range of EMG signals is

   (A) 0.25 to 0.5 mV   (B) 0.5 to 0.75 mV
   (C) 0.75 to 0.9 mV   (D) 0.1 to 0.5 mV
   (E) Answer not known

13. The purpose of an MRI Scan is

   (A) To measure body temperature
   (B) To measure blood pressure
   (C) To image the body's internal structures
   (D) To measure the Sugar level
   (E) Answer not known

14. Doppler Scan , _____ waves is used

   (A) Infra Red   (B) X–Ray
   (C) Ultrasonic   (D) Micro
   (E) Answer not known

15. _____ is not property of Laser beam

   (A) Temporal   (B) Low radiance
   (C) Coherence   (D) Spatial
   (E) Answer not known

16. Contrast medium is used in CT scan, Why?

   (A) To Suppress particular tissue
   (B) To enhance a particular tissue
   (C) To ensure correct tissue is being imaged
   (D) To reduce bone interference
   (E) Answer not known

17. The amount of current that it takes to cause ventricular fibrillation is

   (A) 10 mA   (B) 20 mA
   (C) 100 mA   (D) 15 mA
   (E) Answer not known

18. For which type of modulators used for wireless telemetry for transmitting biomedical signals

    (A) FM Modulator only

    (B) PWM as sub modulator without any other main modulator

    (C) FM as Final modulator and FM as sub modulator

    (D) AM as Final modulator and FM as Sub modulator

    (E) Answer not known

19. If the flow current is directly through the heart, then it produces

    (A) Macro shock   (B) Micro shock

    (C) Electric shock   (D) Leakage current

    (E) Answer not known

20. The safe let go current for men is

    (A) 1 mA   (B) 50 mA

    (C) 9 mA   (D) 20 mA

    (E) Answer not known

21. In order to generate a square wave using Timer IC based astable multivibrator, a ————— is connected across the resistor R_B between Pin No. 6 and Pin No. 7.

    (A) Diode   (B) SCR

    (C) BJT   (D) Capacitor

    (E) Answer not known

22. In a 3-bit weighted Resistor DAC, the resistance value connected in the MSB line is $8k\Omega$. The resistance value connected in the LSB line will be

(A) $32\ k\Omega$ (B) $24\ k\Omega$
(C) $2\ k\Omega$ (D) $4\ k\Omega$
(E) Answer not known

23. The resolution of an 8-bit Analog-to-Digital converter with input voltage range 0 to 10 V is calculated as

(A) 1.25 V   (B) 0.8 V
(C) 0.039 mV   (D) 39.1 mV
(E) Answer not known

24. Which one of the following is not present in the internal block of an OPAMP IC?

(A) Power Amplifier   (B) Oscillator
(C) Level translator   (D) Differential Amplifier
(E) Answer not known

25. The possible values of feedback resistance (R_f) and input resistance (R_1) connected in an OPAMP. Inverting Amplifier circuit designed for a gain of -10 are

(A) $R_f = 11\ k\Omega,\ R_1 = 99\ k\Omega$ (B) $R_f = 99\ k\Omega,\ R_1 = 11\ k\Omega$
(C) $R_f = 10\ k\Omega,\ R_1 = 100\ k\Omega$ (D) $R_f = 100\ k\Omega,\ R_1 = 10\ k\Omega$
(E) Answer not known

26. An example for canonical POS expression will be

    (A) $Y(A,B,C) = \sum(0, 2, 4, 7)$ (B) $Y(A,B,C) = \pi(0, 2, 4, 7)$

    (C) $Y(A,B,C) = A + BC$ (D) $Y(A,B,C) = AB + AC$

    (E) Answer not known

27. The Absorption law of Boolean Algebra is given by :

    (i) $A(A + B) = A$

    (ii) $A + \overline{A}B = A + B$

    Choose the correct option from the following.

    (A) Only (i) is absorption law

    (B) Only (ii) is absorption law

    (C) Neither (i) nor (ii) is absorption law

    (D) Both (i) and (ii) are absorption laws

    (E) Answer not known

28. While performing is complement subtraction, if a carry is generated, it indicates that the result is __(i)__ and hence the carry is __(ii)__

    (A) (i) positive (ii) ignored

    (B) (i) positive (ii) added to the result

    (C) (i) negative (ii) ignored

    (D) (i) negative (ii) added to the result

    (E) Answer not known

29. For the logic circuit given below, the output Y is given by
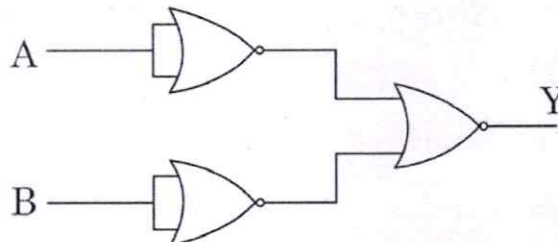
(A) AB (B) $\overline{AB}$

(C) $A + B$ (D) $\overline{A + B}$

(E) Answer not known

30. The Boolean output Y is '1' only if both the inputs A and B are '1' or if both the inputs A and B are '0'. This represents the function of

(A) OR gate   (B) NOR gate

(C) EX-OR gate   (D) EX-NOR gate

(E) Answer not known

31. "Don't care" conditions will always occur in the Truth Table of

(A) Decoder   (B) Demultiplexer

(C) Priority Encoder   (D) Priority Decoder

(E) Answer not known

32. To realize a Boolean function with 'n' inputs, using multiplexer, _____ inputs are given as select lines for the MUX.

(A) n (B) 2^n

(C) $n - 1$ (D) $n + 1$

(E) Answer not known

33. The exact number of 4×1 multiplexers required to realize 16×1 MUX operation (without any additional combinational logic circuits) is

(A) 4   (B) 5

(C) 6   (D) 7

(E) Answer not known

34. The other name of a multiplexer is

(A) Data selector   (B) Data distributor

(C) Data compressor .   (D) Data logger   .

(E) Answer not known

35. The sum output of full adder is obtained by

(A) taking 'OR' of the two inputs

(B) taking 'OR' of the three inputs

(C) taking EX-OR of the two inputs

(D) taking EX-OR of the three inputs

(E) Answer not known

36. The total number of excitation inputs for a Mod-8 synchronous up counter using JK flip flops is _____ excluding common clock input.

(A) 8   (B) 4

(C) 3   (D) 6

(E) Answer not known

37. Which of the following is not a mode of operation for universal shift register?

    (A) Parallel load

    (B) Parallel store

    (C) Shift-Left

    (D) Shift-Right

    (E) Answer not known

38. A counter is designed to count the sequence (0, 1, 2, 3, 5, 9, 10, 12, 13) repeatedly. The name of the counter is

    (A) Arbitrary sequence counter

    (B) Limited sequence counter

    (C) Binary Ripple counter

    (D) Johnson counter

    (E) Answer not known

39. The J-K flip flop can be converted into T flip flop by the following modification in the circuit.

    (A) $T = J = K$

    (B) $T = J = \overline{K}$

    (C) $T = J \,\&\, K = 1$

    (D) $T = K \,\&\, J = 1$

    (E) Answer not known

40. The forbidden state in S-R flip flop is

    (A) $S = 0, R = 0$

    (B) $S = 0, R = 1$

    (C) $S = 1, R = 0$

    (D) $S = 1, R = 1$

    (E) Answer not known

41. Wave excitation of a stepper motor results in

    (A) Half-stepping   (B) Micro stepping
    (C) Increased step angle   (D) Increased torque
    (E) Answer not known

42. Which of the following statements related to servo motor is incorrect?

    (A) It provides high level of torque at high speed
    (B) It is inexpensive and widely available
    (C) Servo motors can work in AC or DC drive
    (D) It can be operated at 80–90% efficiency
    (E) Answer not known

43. The rotor of a stepper motor has no

    (A) Windings   (B) Commutator
    (C) Brushes   (D) All of the above
    (E) Answer not known

44. An open loop control system operates

    (A) with feedback   (B) without feedback
    (C) both (A) and (B)   (D) none of the above
    (E) Answer not known

45. The speed regulation of an induction motor (having low resistance) is usually ——————— at full load.

(A) more than 10%
(B) less than 5%
(C) both (A) and (B)
(D) equal (to full load)
(E) Answer not known

46. The speed of induction motor is $N =$ ———————.

(A) $\dfrac{120 f}{P}$
(B) $Ns(1 - s)$
(C) $Ns/120 f$
(D) $Ns(1 + s)$
(E) Answer not known

47. In industrial drives, a servo motor is used to convert the

(A) final control element into mechanical displacement
(B) final control element into digital code
(C) final control element into analog signal
(D) mechanical displacements into final control element
(E) Answer not known

48. ——————— is used to control the rate of flow of oil which is transmitted at low pressure in a hydraulic system.

(A) Gate valve
(B) Actuator
(C) Needle valve
(D) Relief valve
(E) Answer not known

49. In a hydraulic systems, ———————— is used to limit or control the pressure of oil.

   (A) pump   (B) oil reservoir
   (C) pressure relief valve   (D) actuator
   (E) Answer not known

50. The hydraulic intensifier is used to

   (A) decrease the intensity of pressure of water
   (B) increase the intensity of pressure of water
   (C)· both (A) and (B)
   (D) equal to the intensity of pressure of water
   (E) Answer not known

51. Positive displacement compressors are divided into two groups, namely ———————— and ————————

   (A) Reciprocating type, rotary type compressors
   (B) Centrifugal type, axial type compressor
   (C) Ejector type, dynamic type compressor
   (D) Mono screw type, twin screw compressor
   (E) Answer not known

52. In a hydraulically operated system, the circuit diagram is prepared with symbols according to the ———————— standard.

   (A) ISO/R 2019   (B) ISO/R 2020
   (C) ISO/R 1219   (D) ISO/R 1319
   (E) Answer not known

53. In hydraulic system energy possessed by ——————— is used to perform the required work

    (A) Mercury   (B) Oil

    (C) Diesel   (D) None of the above

    (E) Answer not known

54. In single acting reciprocating pump, the ratio of actual and theoretical discharge is called

    (A) Co-efficient of discharge   (B) Discharge ratio

    (C) Slip   (D) Work done per second

    (E) Answer not known

55. The belt drive which have evenly spaced teeth in its contact surface is

    (A) Flat belt drive   (B) Synchronous belt drive

    (C) Cross belt drive   (D) Open belt drive

    (E) Answer not known

56. A typical industrial robot is equipped with a maximum of ——————— degrees of freedom

    (A) 3   (B) 4

    (C) 6   (D) 8

    (E) Answer not known

57. The basic components, arm, body, wrist of a robot is known as

    (A) End effector   (B) Controller

    (C) Manipulator   (D) Sensors

    (E) Answer not known

58. ———— drive is used for the lighter applications robots.

(A) Pneumatic drive (B) Hydraulic drive

(C) Electric drive (D) Both (B) and (C)

(E) Answer not known

59. In industrial robot which of the following provides rotary motion for the robot.

(A) Rotational joint, twisting joint and revolving joint type

(B) Rotational joint type

(C) Orthogonal joint type

(D) Linear joint type

(E) Answer not known

60. The word Robot is derived from the Czech word "Robota" meaning

(A) Forced worker (B) Toy

(C) Teacher (D) Intelligent labourer

(E) Answer not known

61. Laplace transform of unit impulse function is

(A) 0 (B) 1

(C) S (D) $\dfrac{1}{S}$

(E) Answer not known

62. Laplace transform of $\sin wt$

(A) $\dfrac{s}{s^2 + w^2}$

(B) $\dfrac{w}{s^2 + w^2}$ ✓

(C) $\dfrac{s}{s^2 - w^2}$

(D) $\dfrac{w}{s^2 - w^2}$

(E) Answer not known

63. The step response of a system is given by $y = 6 - \dfrac{4}{5}e^{-5t} + e^{-3t}$. Its impulse response is given by

(A) $4e^{-5t} - 3e^{-3t}$ ✓

(B) $\dfrac{-4}{5}e^{-5t} + e^{-3t}$

(C) $6 - \dfrac{4}{5}e^{-5t} + e^{-3t}$

(D) $-5.e^{-5t} - 3e^{-3t}$

(E) Answer not known

64. The transfer function of a system with impulse response $C(t) = e^{-3t} \times t$ is

(A) $\dfrac{1}{(s+3)}$

(B) $\dfrac{1}{(s+3)^2}$ ✓

(C) $\dfrac{1}{(s-3)}$

(D) $\dfrac{1}{(s-3)^2}$

(E) Answer not known

65. Human is an example for

(A) an open loop control system

(B) a single feedback control system

(C) a multivariable feedback control system

(D) a complex control system

(E) Answer not known

66. The principle of superposition is applied to

(A) Linear time invariant system

(B) Linear time variant system

(C) Non linear time variant system

(D) Non linear time invariant system

(E) Answer not known

67. Time response of undamped system for unit impulse input is

(A) Exponentially increasing

(B) Exponentially decreasing

(C) Constant value at all 't'

(D) Oscillatory with constant maximum amplitude

(E) Answer not known

68. Roots of second order undamped systems are

(A) Complex conjugates and lie on the left half of the s-plane

(B) Real and equal

(C) Real and unequal

(D) Complex conjugates and lie on the imaginary axis

(E) Answer not known

69. The transfer function of the system is $G(s)=\dfrac{1}{s^2(s+1)}$. Type and order of the system is

(A) 1, 2   (B) 2, 1

(C) 2, 3   (D) 3, 2

(E) Answer not known

70. The transfer function of first order system is $G(s)=\dfrac{5}{s+5}$. Then the time constant of the system is

(A) 0.2   (B) 1.0

(C) 5.0   (D) 10.0

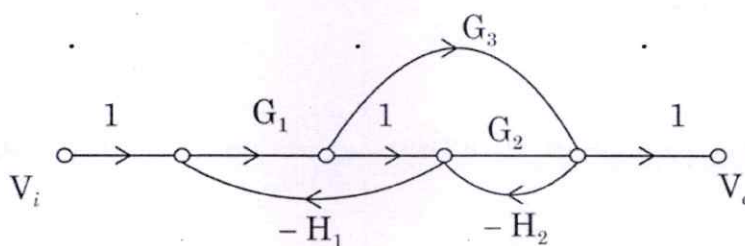(E) Answer not known

71. Impulse response of first order system with transfer function $\dfrac{C(s)}{R(s)}=\dfrac{1}{TS+1}$ is

(A) $C(t)=1-e^{-t/T}$ for $t\geq 0$

(B) $C(t)=t-T+Te^{\frac{-t}{T}}\ \ t\geq 0$

(C) $C(t)=Te^{\frac{-t}{T}}\ \ t\geq 0$

(D) $C(t)=\dfrac{1}{T}e^{\frac{-t}{T}}\ \ t\geq 0$

(E) Answer not known

72. What is the order of the following Transfer function
$$G(s) = \frac{s-10}{s^2 + 2s + 1}$$

(A) First order   (B) Second order
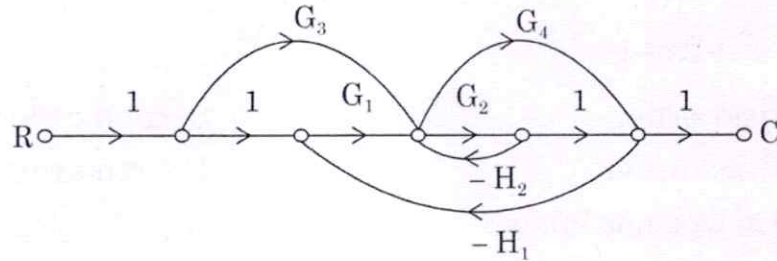(C) Third order   (D) Fourth order
(E) Answer not known

73. The transfer function of the system represented by the following signal flow graph is

(A) $\dfrac{V_0(s)}{V_i(s)} = \dfrac{G_1 G_2}{1 + G_1 H_1 + G_2 H_2}$

(B) $\dfrac{V_0(s)}{V_i(s)} = \dfrac{G_1 G_2 + G_1 G_3}{1 + G_1 H_1 + G_2 H_2}$

(C) $\dfrac{V_0(s)}{V_i(s)} = \dfrac{G_1 G_2 + G_1 G_3}{1 + G_1 H_1 + G_2 H_2 + G_1 G_3 H_1 H_2}$

(D) $\dfrac{V_0(s)}{V_i(s)} = \dfrac{G_1 G_2 + G_1 G_3}{1 + G_1 H_1 + G_2 H_2 - G_1 G_3 H_1 H_2}$

(E) Answer not known

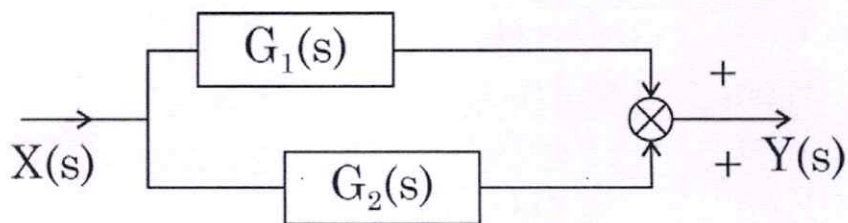74. How many forward paths the signal flow graph has

(A) 1   (B) 2

(C) 3   (D) 4

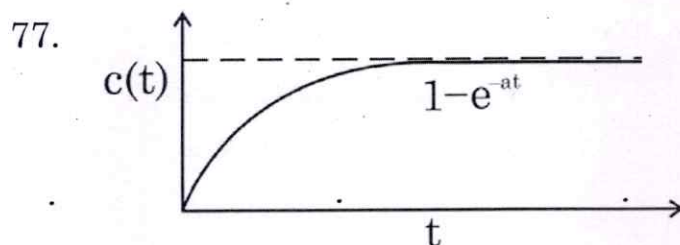(E) Answer not known

75. Equivalent transfer function $\left(\dfrac{Y(s)}{X(s)}\right)$ of the following block diagram

is

(A) $G_1(s)G_2(s)$ (B) $\dfrac{G_1(s)}{1+G_2(s)}$

(C) $G_1(s)+G_2(s)$ (D) $\dfrac{G_2(s)}{1+G_1(s)}$

(E) Answer not known

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76. If the maximum phase angle contributed system is −90°, then the system is

    (A) absolutely stable   (B) marginally stable

    (C) limitedly stable   (D) unstable

    (E) Answer not known

77.

$c(t)$ $1-e^{-at}$ t

The above figure shows the ——————— response of first order system.

    (A) Unit Impulse   (B) Unit Step

    (C) Unit Ramp   (D) Unit Parabolic

    (E) Answer not known

78. If any one root of the characteristic equation of the closed loop system lie on the right half of the s-plane, then the system is called

    (A) Absolutely stable   (B) Marginally stable

    (C) Limitedly stable   (D) Unstable

    (E) Answer not known

79. Which of the following statements are correct about stability of a system

    (1)   For stability the impulse response must tend to zero as time tends to infinity

    (2)   For all poles located at right half of s-plane, the system is stable

    (3)   For repeated poles on jw axis, the system is stable

    (A) (1) alone is correct   (B) (2) and (3) are correct
    (C) (2) alone is correct   (D) (3) alone is correct
    (E) Answer not known

80. Which of the following is not related to frequency domain analysis

    (A) Nyquist analysis   (B) Bode plot
    (C) Nichols chart   (D) Root locus
    (E) Answer not known

81. The ripple factor in a capacitor filter is ____(i)____ proportional to the capacitance and ____(ii)____ proportional to the load resistance.

    (A) (i) Directly (ii) Inversely   (B) (i) Directly (ii) Directly
    (C) (i) Inversely (ii) Directly   (D) (i) Inversely (ii) Inversely
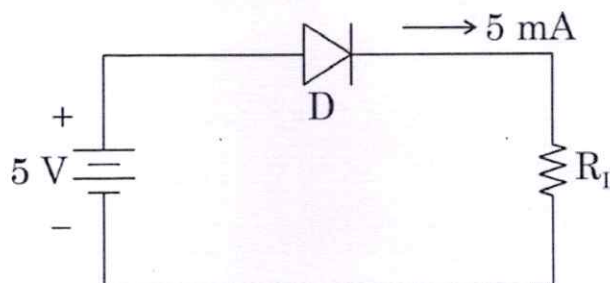   (E) Answer not known

82. The number of PN junction diodes used in a Bridge rectifier is
    ___(i)___ and the type of transformer used is ___(ii)___

    (A) (i) 2 (ii) step down with centre tap

    (B) (i) 4 (ii) step down without centre tap

    (C) (i) 2 (ii) step down without centre tap

    (D) (i) 4 (ii) step down with centre tap

    (E) Answer not known

83. The doping level in zener diode is ___(i)___ than that of PN junction
    diode and hence Breakdown occurs at a ___(ii)___ reverse voltage.

    (A) (i) heavier (ii) lower   (B) (i) heavier (ii) higher

    (C) (i) lighter (ii) lower   (D) (i) lighter (ii) higher

    (E) Answer not known

84. A silicon PN junction diode is supplied with a bias as shown below :

    The resistance across the diode will be approximately ————.
    Assume T = 300 K.

    (A) 10 MΩ   (B) 10 KΩ

   (C) 10 Ω   (D) 10 mΩ

    (E) Answer not known

85. The charge of an electron or hole is given by

(A) 1.38×10^{16} coulombs

(B) 1.6×10^{-19} coulombs

(C) 1.38×10^{-16} coulombs

(D) 1.6×10^{19} coulombs

(E) Answer not known

86. N-type semiconductor can be called

(A) Intrinsic semiconductor

(B) Extrinsic semiconductor

(C) Negative type semiconductor

(D) Pure semiconductor

(E) Answer not known

87. 7-segment code of the following in common Anode type display is
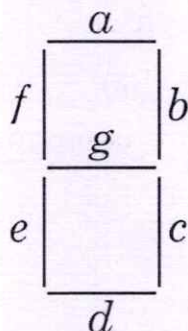
(A)

g	f	e	d	c	b	a
1	0	1	0	1	0·	1

(B)

g	f	e	d	c	b	a
0	0	0	1	1	1	1

(C)

g	f	e	d	c	b	a
1	1	0	0	1	1	0

(D)

g	f	e	d	c	b	a
0	0	1	1	0	0	1

(E)   Answer not known

88.   Which of the following statement is true in RC coupled Two-stage Amplifier?

(A)   Over all gain of Amplifier is the gain of First stage

(B)   Over all gain of Amplifier is the gain of Second stage

(C)   Output voltage is out of phase with input voltage

(D)   Output voltage is in phase with input voltage

(E)   Answer not known

89. In an RC coupled amplifier, the first stage output is coupled to the second stage input through

   (A) collector resistance (R_C)

   (B) a network of R and C components

   (C) a coupling capacitor

   (D) a coupling resistor

   (E) Answer not known

90. A BJT in CE configuration has β value of 50. If the base current is 46.5 μA and the DC supply voltage is 10 V, the value of collector current flowing through the collector resistance of 2 kΩ will be

   (A) 0.465 mA   (B) 5 mA

   (C) 2.325 mA   (D) 25 mA

   (E) Answer not known

91. The highest input impedance is offered by the ——————— configuration in BJT circuits.

   (A) Common Emitter (CE)   (B) Common Base (CB)

   (C) Common Collector (CC)   (D) Common Gate (CG)

   (E) Answer not known

92. Centrifugal switch fitted on the rotor of a 1-φ induction motor will work when

   (A) Rotor speed reaches its rated value

   (B) Rotor speed exceeds 70% of its rated value

   (C) Rotor speed exceeds synchronous speed

   (D) Rotor speed exceeds 40% of its rated value

   (E) Answer not known
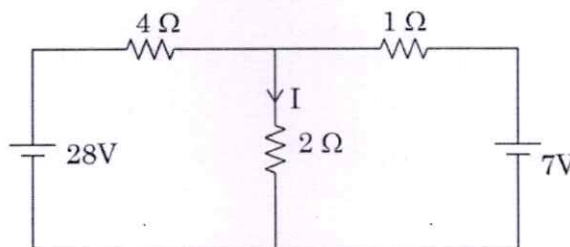
93. Rating of a transformer is given in

    (A) KVA   (B) KW

    (C) KVAR   (D) KWhr

    (E) Answer not known

94. The rotational speed of a stepper motor depends on

    (A) Magnitude of supply voltage

    (B) Polarity of stator current

    (C) Magnitude of stator current

    (D) Step pulse frequency

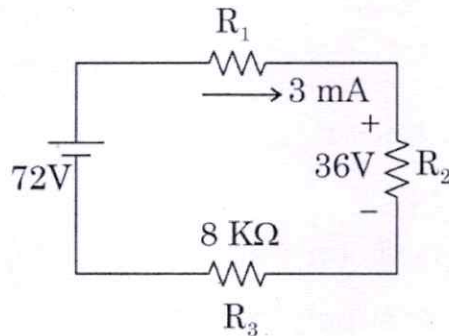   (E) Answer not known

95. Find the current I through 2Ω Resistor in the given circuit

    (A) 2A   (B) 3A

    (C) 4A   (D) 5A

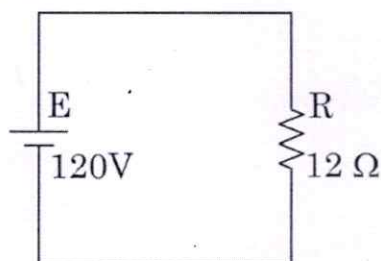   (E) Answer not known

96. Find R_1 and R_2 in the given circuit

(A) $R_1 = 3\,k\Omega$, $R_2 = 4\,k\Omega$ (B) $R_1 = 4\,k\Omega$, $R_2 = 3\,k\Omega$

(C) $R_1 = 4\,k\Omega$, $R_2 = 12k\Omega$ (D) $R_1 = 12\,k\Omega$, $R_2 = 4\,k\Omega$

(E) Answer not known

97. A 48 Ω hot water heater is connected to a 120 V – source. What is the current drawn?
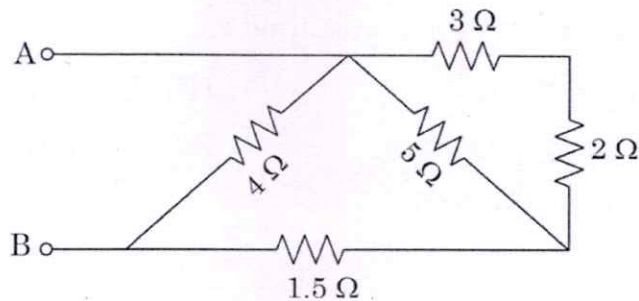
(A) 0.4 A   (B) 2.5 A

(C) 2 A   (D) 72 A

(E) Answer not known
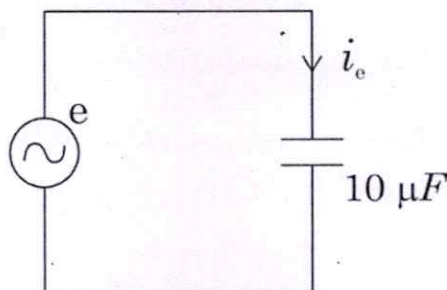
98. Compute the power supplied to electric heater

(A) 1440 W   (B) 1200 W

(C) 1400 W   (D) 1340 W

(E) Answer not known

99. Calculate the equivalent resistance between A and B

(A) 2 Ω   (B) 4 Ω

(C) 6 Ω   (D) 8 Ω

(E) Answer not known

100. The voltage across a 10 μF capacitance is $V_c = 100 \sin(\omega t - 40°)\, V$ and $f = 1000\, \text{Hz}$. Determine i_c.

(A) $4.28 \sin(8263\, t + 50°)\, \text{A}$ (B) $4.28 \sin(6283\, t + 40°)\, \text{A}$

(C) $6.28 \sin(6283\, t + 50°)\, \text{A}$ (D) $6.28 \sin(6283\, t - 90°)\, \text{A}$

(E) Answer not known

101. Output of digital control logic is connected through ———————— with final control elements.

(A) Analog to digital converter   (B) Digital to analog converter

(C) Measuring device   (D) None of the above

(E) Answer not known

102. The process is said to be ——————— when its output remains bounded at all times for a bounded input.

   (A) Stable   (B) Unstable
   (C) Marginally unstable   (D) Partially unstable
   (E) Answer not known

103. The increase in differential gap causes ——————— the life of final control element.

   (A) Decreases   (B) Increases
   (C) Has no effect on   (D) None of the above
   (E) Answer not known

104. A unity feedback system is given by open loop transfer function, $G(s)=\dfrac{K}{S(S+10)}$. The natural frequency of closed loop system is ——————— if it has a damping ratio of 0.5.

   (A) 20   (B) 5
   (C) 10   (D) 50
   (E) Answer not known

105. The derivative controller cannot be used alone when

   (A) The error is increasing
   (B) The set point is changing
   (C) The error remains constant
   (D) The process output is changing
   (E) Answer not known

106. Derivative controller is also called as

    (A) Anticipatory controller   (B) Reset controller

    (C) On-off controller   (D) None of the above

    (E) Answer not known

107. Using Cohen and Coon method find the PI controller settings for a process with open loop transfer function $G(s) = \dfrac{e^{-s}}{1+s}$.

    (A) $K_c = 0.983$, $\tau_i = 1.14$ (B) $K_c = 0.5$, $\tau_i = 0.7$

    (C) $K_c = 1.9$, $\tau_i = 2.3$ (D) $K_c = 1$, $\tau_i = 1.4$

    (E) Answer not known

108. Electronic controllers outperform pneumatic controllers in terms to

    (A) Speed   (B) Size

    (C) Flexibility   (D) All of the above

    (E) Answer not known

109. Ziegler and Nichols method of controller is also called as

    (A) Ultimate cycle method   (B) Damper oscillation method

    (C) IAE method   (D) ITAE method

    (E) Answer not known

110. Electronic proportional controller requires ———————— op-amps.

    (A) 1   (B) 2

    (C) 3   (D) 4

    (E) Answer not known

111. Which one of the following is open loop response method of tunning?

(A) Ziegler-Nichols method

(B) Process reaction curve method

(C) Damped oscillation method

(D) Frequency response method

(E) Answer not known

112. In discontinuous controller, two position control modes are best suited for

(A) Small scale systems with relatively fast process rates

(B) Small scale systems with relatively slow process rates

(C) Large scale systems with relatively fast process rates

(D) Large scale systems with relatively slow process rates

(E) Answer not known

113. In P to I converter, the value or range of current signal is

(A) (0-20) mA   (B) (4-20) mA

(C) (0-10) mA   (D) (4-10) mA

(E) Answer not known

114. Find the rangeability if an equal percentage value has a maximum flow of 50 cm³/s and a minimum flow of 2 cm³/s

(A) 25   (B) 100

(C) 0.04   (D) 4

(E) Answer not known

115. Best suited characteristics for globe values are

(A) Linear and equal percentage

(B) Quick opening and equal percentage

(C) Linear and quick opening

(D) None of the above

(E) Answer not known

116. As per ISA standards in P & ID, is used to represent

(A) Electrical signal (B) Hydraulic signal

(C) Pneumatic signal (D) Connection to process

(E) Answer not known

117. ———— control should be used to maintain correct air and fuel mixture for optimal combustion.

(A) Feedback control (B) Feed forward control

(C) Cascade control (D) Ratio control

(E) Answer not known

118.

TIC
329
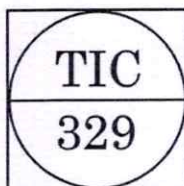
is a computer control representation in a P & ID. TIC in the symbol is ————

(A) Temperature increasing control

(B) Temperature indicating controller

(C) Time indicating clock

(D) Time increasing controller

(E) Answer not known

119. The output signal of the ———————— controller serves as the set point for the ———————— controller in a cascade control loop.

(A) Primary, Secondary   (B) Secondary, Primary

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

(E) Answer not known

120. Digital controllers are basically ————————.

(A) Analog to digital converters

(B) Digital to analog converters

(C) Programs run on digital hardware with processor

(D) None of the above

(E) Answer not known

121. The Bourdon Tube converts

(A) Pressure into displacement   (B) Displacement into pressure

(C) Pressure into voltage   (D) Voltage into pressure

(E) Answer not known

122. Which of the following Photo-Electric devices is most suitable for Digital applications?

(A) Photo-Emissive cell   (B) Photo Diode

(C) Photo Transistor   (D) Photo Voltaic Cell

(E) Answer not known

123. The gauge factor of a strain gauge is

(A) $\dfrac{\Delta L / L}{\Delta R / R}$

(B) $\dfrac{\Delta R / R}{\Delta L / L}$

(C) $\dfrac{\Delta R / R}{\Delta D / D}$

(D) $\dfrac{\Delta R / R}{\Delta P / P}$

(E) Answer not known

124. Which one of the following transducer can act as an Inverse Transducer?

(A) Electrical Resistance potentiometer

(B) LVDT

(C) Capacitive Transducer

(D) Piezo Electric Crystals

(E) Answer not known

125. Strain gauge works in the principle of

(A) Hall Effect   (B) Piezo Electric Effect

(C) Piezo Resistive Effect   (D) Magnetic Striction

(E) Answer not known

126. The Transducer employed for measurement of angular displacement is

(A) LVDT   (B) Thermocouple

(C) Themistor   (D) Circular potentiometer

(E) Answer not known

127. Which of the following is not a type of pressure sensing element?

    (A)   Bellows
    (B) Bourdon tube
    (C)   Orifice plate
    (D) Diaphragm
    (E)   Answer not known

128. Thermocouples are

    (A)   Passive transducers
    (B)   Active transducers
    (C)   Both active and passive transducers
    (D)   Output transducers
    (E)   Answer not known

129. Potentiometer transducers are used for the measurement of

    (A)   Pressure
    (B) Displacement
    (C)   Humidity
    (D) Both (A) and (B)
    (E)   Answer not known

130. Strain gauge with higher gauge factor which is used to measure very small strain is

    (A)   Resistance Wire Strain gauge
    (B)   Bonded Metal Foil Strain gauge
    (C)   Semi Conductor Strain gauge
    (D)   Unbonded Strain gauge
    (E)   Answer not known

131. Instrument has no drift when it has

    (A) Good accuracy   (B) Perfect reproducibility
    (C) Perfect repeatability   (D) Good precision
    (E) Answer not known

132. Errors mainly covers human mistakes in reading instruments, recording and calculating measurement results is

    (A) Gross error   (B) Systematic error
    (C) Random error   (D) Instrumental error
    (E) Answer not known

133. A resistor value is measured as 0.000030 MΩ. State the number of significant figure is

    (A) 2   (B) 4
    (C) 6   (D) 5
    (E) Answer not known

134. If the input of an instrument is increased from zero, there will be some minimum value below which no change in output can be detected. This property of instrument is

    (A) Linearity   (B) Threshold
    (C) Hysteresis   (D) Sensitivity
    (E) Answer not known

135. One of the combinations of materials used for optical fibers is

    (A)   Copper core and glass cladding

    (B)   Glass core and aluminum cladding

    (C)   Glass core and plastic cladding

    (D)   Plastic core and glass cladding

    (E)   Answer not known

136. The hall effect principle is used in

    (A)   Voltmeters

    (B)   Poynting vector wattmeter

    (C)   Flux meters

    (D)   Flux meters and poynting vector wattmeter

    (E)   Answer not known

137. The light signal of the detector changes of a result of some transducer type of device, then the sensor is called

    (A)   Intrinsic sensor   (B) Extrinsic sensor

    (C)   Biosensor   (D) Intensity sensor

    (E)   Answer not known

138. The usage of electronic instruments is becoming more extensive because they have

    (A)   a high sensitivity and reliability

    (B)   a fast response and compatibility with digital computers

    (C)   the capability to respond to signals from remote places

    (D)   all of the above

    (E)   Answer not known

139. The dynamic characteristic of a measurement system are

    (1)   Speed of response

    (2)   Measuring lag

    (3)   Dynamic error

    (A)   Only (1) and (2)   (B) Only (2)

    (C)   Only (3)   (D) (1), (2) and (3)

    (E)   Answer not known

140. The degree of closeness with which a given value may be repeatedly measured is called

    (A)   Accuracy   (B) Precision

    (C)   Reproducibility   (D) Hysteresis

    (E)   Answer not known

141. Primary current in a current transformer is determined by

    (A)   The load on the system

    (B)   The load on its own secondary

    (C)   The load on its own primary

    (D)   Burden load

    (E)   Answer not known

142. The transformation ratio in the case of a current transformer is defined as ratio of

(A) Primary winding current/secondary winding current

(B) Rated primary winding current/Rated secondary winding current

(C) Number of turns of primary winding/number of turns of secondary winding

(D) Rated secondary winding current/rated primary winding current

(E) Answer not known

143. The disadvantages of shunts for use at high currents are

(1) It is difficult to achieve good accuracy with shunts

(2) Power consumption of the shunt is large

(3) The metering circuit is not electrically isolated from the power circuit

(A) Only (1)　　　　　　　(B) Only (2)

(C) Only (1) and (2)　　　(D) (1), (2), and (3)

(E) Answer not known

144. In potential transformer, winding resistance can be minimized by using

(A) Thin conductors

(B) Thin conductors and large length of turns

(C) Thick conductors and smallest length of mean turn

(D) Thick conductors and large length of turns

(E) Answer not known

145. In potential transformer, the secondary winding is designed so that a voltage of ———————— is delivered to the instrument load

(A) 100 to 120 V (B) 160 to 180 V

(C) 240 to 260 V (D) 200 to 220 V

(E) Answer not known

146. Which CRT is used in a digital storage oscilloscope?

(A) Multi trace (B) Dual trace

(C) Modern (D) Conventional

(E) Answer not known

147. A variable reluctance type tachometer has 60 rotor teeth. The counter records 3600 counts per second. Determine the speed in rpm.

(A) 3300 rpm (B) 3600 rpm

(C) 2600 rpm (D) 3000 rpm

(E) Answer not known

148. Period measurement is done in frequency meters for achieving high accuracy in the case of

(A) High frequencies

(B) Medium frequencies

(C) High and medium frequencies

(D) Low frequency

(E) Answer not known

149. A basic digital multimeter is made up of

   (A)   Oscillator, amplifier

   (B)   Diode, op-amp

   (C)   A/D converters, attenuator and counter

   (D)   Rectifier, Schmitt trigger

   (E)   Answer not known

150. Input range of DVM is

   (A)   1 V to 1000 V   (B) 0.1 V to 10 V

   (C)   0.01 V to 1 V   (D) 0.001 V to 0.1 V

   (E)   Answer not known

151. A signal applied to a CRO has a rising time of 0.5 µs. Its bandwidth is

   (A)   0.7 MHz   (B) 0.05 MHz

   (C)   0.07 MHz   (D) 0.2 MHz

   (E)   Answer not known

152. Most oscilloscopes use ———————— deflection

   (A)   Electromagnetic   (B) Electrostatic

   (C)   Current   (D) Voltage

   (E)   Answer not known

153. The heart of cathode ray oscilloscope is

   (A)   Electron beam   (B) Vertical amplifier

   (C)   Horizontal amplifier   (D) Cathode ray tube

   (E)   Answer not known

154. The ——————— is a grid of lines that serves as a scale when making time and amplitude measurements

    (A) Focus control   (B) Intensity control

    (C) Graticule   (D) Aquadag

    (E) Answer not known

155. An analog storage CRO is used for displaying waveforms in the frequency range of

    (A) Low frequency   (B) High frequency

    (C) Very low frequency   (D) Very high frequency

    (E) Answer not known

156. In wheatstone bridge, the bridge is said to be balanced when

    (A) there is no current that flows through the galvanometer

    (B) there is current that flows through the galvanometer

    (C) there is potential difference between galvanometer terminal

    (D) the galvanometer reading is maximum

    (E) Answer not known

157. The accuracy of moving iron instruments is affected by

    (A) Hysteresis, frequency changes and stray magnetic fields

    (B) Magnetic field strength

    (C) Coil resistance

    (D) Voltage fluctuations

    (E) Answer not known

158. What will be the direction of deflecting torque in a moving iron instrument of the direction of current in the coil is reversed at the same magnitude?

(A)   Reverse direction   (B) Reduced by half

(C)   Same direction   (D) Reduced to zero

(E)   Answer not known

159. In a d'Arsonval meter, the resistance of multiplier is

(A) $Rs = (m-1)Rm$ (B) $Rm = (m-1)Rs$

(C) $Rs = \dfrac{(m-1)}{Rm}$ (D) $Rm = m \cdot Rs$

(E)   Answer not known

160. In a d'Arsonval galvanometer, the iron core is ———————— in shape of the coil is circular but is ———————— if the coil is rectangular.

(A)   Rectangular, cylindrical   (B) Cylindrical, spherical

(C)   Spherical, cylindrical   (D) Spherical, circular

(E)   Answer not known

161. The time constant of thermistor depends upon

(A)   Mass   (B) Specific heat

(C)   Area of heat transfer   (D) All of the above

(E)   Answer not known

162. Which of the following is used as protective elements in electric Machines?

(A) PTC thermistors (B) NTC thermistors

(C) RTD (D) Thermocouple

(E) Answer not known

163. Three lead wire RTDS can provide accurate results only if ,

(A) Lead wires are made of plantinum

(B) RTDS are used to measure above 500°C

(C) All lead wires are equal

(D) RTDS are used to measure clean liquids

(E) Answer not known

164. Match the correct options

(1) Thermistors — Non linear

(2) Thermocouple — Sensitivity

(3) RTD — Active device

(4) IR Thermometer — Response time

(A) (1) and (4) are correct (B) (1) and (2) are correct

(C) (2) and (4) are correct (D) (3) and (4) are correct

(E) Answer not known

165. Thermistors are extremely useful for precision temperature measurements due to its

   (A) High accuracy
   (B) High temperature applications
   (C) High sensitivity
   (D) High linearity
   (E) Answer not known

166. Find the velocity of air flow at the head of a pivot tube of it produces a pressure differential of 10 KPa between the outlets obtained in air at an altitude where the density of air is 0.650 kg/m³.

   (A) 175.41 m/s   (B) 170 m/s
   (C) 172.31 m/s   (D) 172 m/s
   (E) Answer not known

167. The principle of operation of Electro magnetic flow meter is based on

   (A) Lenz's law   (B) Faraday's law
   (C) Coulomb's law   (D) Ohm's law
   (E) Answer not known

168. Rotameter is a

   (A) drag force flow meter
   (B) variable head flow meter
   (C) variable area flow meter
   (D) rotating propeller type flow meter
   (E) Answer not known

169. The unit of rate of flow of discharge is

    (A) m^2/sec
    (B) m^3/sec
    (C)   litre sec
    (D)   m/sec
    (E)   Answer not known

170. The Reynolds number is represented as

    (A) $Re = \dfrac{VD}{\rho}$
    (B) $Re = \dfrac{\mu VD}{\rho}$

    (C) $Re = \dfrac{\rho VD}{\mu}$
    (D) $Re = \dfrac{\rho V}{D}$

    (E)   Answer not known

171. ——————— is the ratio of mass of water vapor to the mass of dry gas in a given volume.

    (A)   Relative humidity
    (B)   Solubility
    (C)   Specific humidity
    (D)   None of the above
    (E)   Answer not known

172. The disadvantage in capacitive level measurement is

    (A)   Metallic parts must be insulated from one another
    (B)   Non linear behaviour
    (C)   High output impedance
    (D)   All of the above
    (E)   Answer not known

173. ——————— level detector is used for liquid, solid and interface level measurement.

    (A) Sight glass   (B) Floats

    (C) Displacers   (D) Ultrasonic level detectors

    (E) Answer not known

174. Displacers follow

    (A) Newton III law   (B) Boltzmann law

    (C) Archimede's principle   (D) Bernoulli's principle

    (E) Answer not known

175. Piezoelectricity can be used to measure pressure by measuring

    (A) Electrostatic charge   (B) Piezo resistivity

    (C) Resonant frequency   (D) All of the above

    (E) Answer not known

176. ——————— are thin walled cylindrical shells with deep convolutions.

    (A) Manometers   (B) Diaphragm

    (C) Bellows   (D) Bourdon gauge

    (E) Answer not known

177. Fluid pressure in dead weight tester depends upon

    (A) Mass of the weights and piston

    (B) Mass of the dead weight tester

    (C) Mass of the weights

    (D) Mass of the pressure gauge

    (E) Answer not known

178. Pirani gauge measures vacuum by

    (A)   Change in ionisation potential

    (B)   Change in thermal conductivity

    (C)   Deformation to elastic body

    (D)   Change in self inductance

    (E)   Answer not known

179. In Dunmore cells meant for moisture measurement, output is in the form of

    (A)   Resistance   (B) Capacitance

    (C)   Inductance   (D) Light intensity

    (E)   Answer not known

180. Convert the pressure of 20 kg/cm² into bar units

    (A)   1.942 bar   (B) 19.42 bar

    (C)   20 bar   (D) 18.52 bar

    (E)   Answer not known

181. The buck converter gives an output voltage that is always ——————— the input voltage.

    (A)   Smaller than   (B) Greater than

    (C)   Equal to   (D) None of the above

    (E)   Answer not known

182. In a 3–4, 6 pulse converter, SCRs from both positive and negative group are fired at an interval of

   (A) 120°   (B) 90°
   (C) 180°   (D) 60°
   (E) Answer not known

183. Total harmonic distortion (THD) of a single phase full bridge inverter is

   (A) 48.34 %   (B) 46.34 %
   (C) 48.43 %   (D) 46.43 %
   (E) Answer not known

184. Four quadrant chopper is also known as

   (A) Type A chopper   (B) Type C chopper
   (C) Type D chopper   (D) Type E chopper
   (E) Answer not known

185. Choose the right matches among the following

   (1) Converter –   AC to DC Converter

   (2) Inverter   –   DC to AC Converter

   (3) Choppers   –   DC to DC Converter

   (A) (1) and (2) are correct   (B) (2) and (3) are correct
   (C) (3) and (1) are correct   (D) (1), (2) and (3) are correct
   (E) Answer not known

186. Which of the following statements are true about advantages of using a freewheeling diode in a converter?

    (1)   Input power factor is improved

    (2)   Load current waveform is improved

    (3)   Overall converter efficiency is improved

    (A)   (1) and (2) only   (B) (2) and (3) only

    (C)   (1) and (3) only   (D) (1), (2) and (3)

    (E)   Answer not known

187. The commutation method which is used in Jones chopper circuit is

    (A)   Class A   (B) Class B

    (C)   Class C   (D) Class D

    (E)   Answer not known

188. Type of commutation which employs a pulse transformer is

    (A)   Class A Commutation   (B) Class B Commutation

    (C)   Class D Commutation   (D) Class E Commutation

    (E)   Answer not known

189. Match the following correctly

    (1)   Class A Commutation – Impulse Commutation

    (2)   Class B Commutation – Resonant Commutation

    (3)   Class C Commutation – Current Commutation

    (4)   Class D Commutation – Voltage Commutation

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

    (C)   (3), (4), (1), (2)   (D) (1), (4), (3), (2)

    (E)   Answer not known

[Turn over

190. For commutation of a thyristor, which of the following statements are true?

(i) Anode current must falls below latching current

(ii) Anode current must falls below holding current

(iii) Reverse voltage must be applied to thyristor for a sufficient time

(A) (ii) only

(B) (ii) and (iii) only

(C) (i), (ii) and (iii)

(D) (i) and (iii) only

(E) Answer not known

191. Function of pulse transformer in a firing circuit is

(A) to amplify the gate pulses

(B) to isolate low voltage gate - cathode circuit from the high voltage anode cathode circuits

(C) to transmits amplified pulses

(D) to produce gating pulses at desired instant

(E) Answer not known

192. Which of the following statements are true about additional advantages of no-break ups over short break ups?

(1) The inverter can be used to condition the supply delivered to load.

(2) Load gets protected from transients in the main supply

(3) Inverter output cannot be maintained at the desired value.

(A) (1) and (2) are correct

(B) (1) and (3) are correct

(C) (2) and (3) are correct

(D) (1), (2) and (3) are correct

(E) Answer not known

193. Which of the following statements are true about SMPS?

(1) It works like a dc chopper

(2) PWM technique is used for the inverter

(3) It is small in size and weigh loss.

(A) (1) and (2) are correct (B) (2) and (3) are correct

(C) (1) and (3) are correct (D) (1), (2) and (3) are correct

(E) Answer not known

194. Duty cycle of an ac voltage controller is 0.25, then the value of input power factor is

(A) 0.5 (B) 0.05

(C) 0.25 (D) 0.025

(E) Answer not known

195. Choose the right matches among the following :

(a) IGBT   1. Turn off is controlled
(b) SCR   2. Two transistor analogy
(c) GTO   3. Used in SMPS
(d) MOSFET   4. Combines features of BJT and MOSFET

	(a)	(b)	(c)	(d)
(A)	3	2	1	4
(B)	4	3	2	1
(C)	4	2	1	3
(D)	4	1	2	3

(E) Answer not known

196. Overload capability of an IGBT compared to MOSFET is

    (A) high   (B) low

    (C) same   (D) not comparable

    (E) Answer not known

197. Snubber circuit is used to limit the rate of

    (A) rise of current

    (B) conduction period

    (C) rise of voltage across SCR

    (D) rise of voltage across the load

    (E) Answer not known

198. Main application of power MOSFET is in

    (A) UPS   (B) Charging batteries

    (C) SMPS   (D) Inverters

    (E) Answer not known

199. A SCR is a

    (A) Unidirectional switch   (B) Bidirectional switch

    (C) Mechanical switch   (D) Current controlled switch

    (E) Answer not known

200. Which of the following statements are true about circuit turnoff time of main thyristor in class B commutation?

(i) depends on load current

(ii) depends on capacitance

(iii) depends on inductance

(A) (i) only

(B) (ii) only

(C) (iii) only

(D) (i) and (ii) only

(E) Answer not known

_____