ELIN

Register Number

2013
ELECTRICAL & INSTRUMENTATION ENGINEERING
(Degree Standard)

Time Allowed : 3 Hours]   **[Maximum Marks : 300**

Read the following instructions carefully before you begin to answer the questions
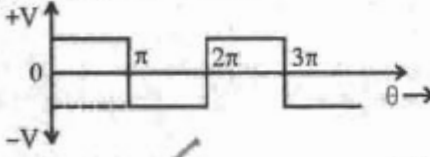
IMPORTANT INSTRUCTIONS

1. This Booklet has a cover (this page) which should not be opened till the invigilator gives signal to open it at the commencement of the examination. As soon as the signal is received you should tear the right side of the booklet cover carefully to open the booklet. Then proceed to answer the questions.

2. This Question Booklet contains **200** questions.

3. Answer **all** questions.

4. **All** questions carry equal marks.

5. You must write your Register Number in the space provided on the top right side of this page. Do not write anything else on the Question Booklet.

6. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. You must write your Name, Register No., Question Booklet Sl. No. and other particulars with Blue or Black ink Ball point pen on side 2 of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated.

7. You will also encode your Register Number, Subject Code, Question Booklet Sl. No. etc. with Blue or Black ink Ball point pen in the space provided on the side 2 of the Answer Sheet. If you do not encode properly or fail to encode the above information, your Answer Sheet will not be evaluated.

8. Each question comprises *four* responses (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case, you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.

9. In the Answer Sheet there are **four** brackets [A] [B] [C] and [D] against each question. To answer the questions you are to mark with Ball point pen ONLY ONE bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong *e.g.* If for any item, [B] is the correct answer, you have to mark as follows :

[A] ■■ [C] [D]

10. You should not remove or tear off any sheet from this Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. After the examination is concluded, you must hand over your Answer Sheet to the Invigilator. You are allowed to take the Question Booklet with you only after the Examination is over.

11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.

12. Do not tick-mark or mark the answers in the Question booklet.

13. The last sheet of the Question Booklet can be used for Rough Work.

1. The particles acting as current carriers in a metallic conductors are
   (A) electrons and ions
   (B) only ions
   (C) only electrons
   (D) protons

2. Ampere-second could be the unit of
   (A) emf
   (B) charge
   (C) power
   (D) energy

3. Which of the following current is considered dangerous for the human body ?
   (A) 1 mA
   (B) 25 mA
   (C) 500 mA
   (D) 10 mA

4. The time period of an alternating quantity is 0.02 second. Its frequency will be
   (A) 25 Hz
   (B) 50 Hz
   (C) 100 Hz
   (D) 0.02 Hz

5. An electric iron is rated as 230 V, 500 W, ac. The value of 230 V refers to
   (A) rms value
   (B) average value
   (C) peak value
   (D) peak to peak value

6. The capacitive reactance of a capacitor of 1 Farad at 10^3 Hz is
   (A) $\frac{1}{2\pi} \times 10^3$
   (B) $\frac{1}{2\pi} \times 10^{-3} \Omega$
   (C) $2\pi \times 10^3 \Omega$
   (D) $2\pi \times 10^{-3} \Omega$

7. The power consumed in a 3 phase delta connected load will be
   (A) $V_L I_L$
   (B) $V_L I_L \cos\theta$
   (C) $\sqrt{3}\ V_L I_L \cos\theta$
   (D) $3 V_L I_L \cos\theta$

8. The voltage drop across a resistor of 100 Ω is 10 Volts. The wattage of the resistor must be
   (A) ½ W
   (B) 1 W
   (C) 2 W
   (D) 4 W

9. For the given signal, the form factor and the peak factor is

   (A) 1.11 and 1.414
   (B) 1 and 1
   (C) 1 and 1.11
   (D) 1.414 and 1

10. The inductive reactance of an inductance of $\frac{1}{\pi}$ Henry at 50 Hz is
    (A) 100 Ω
    (B) $\frac{50}{\pi} \Omega$
    (C) $\frac{\pi}{50} \Omega$
    (D) $50\pi \Omega$

11. Transformer excited from a sinusoidal voltage source will draw a no-load current, which
    (A) is sinusoidal and of the same frequency as the voltage source.
    (B) comprises the fundamental frequency (same as that of the voltage source) and the peaking third harmonic.
    (C) comprises the fundamental frequency and the depressing third harmonic.
    (D) is sinusoidal of frequency three times that of the voltage source.

12. A single-phase transformer when supplied from 220 V, 50 Hz has eddy current loss of 50 W. If the transformer is connected to a voltage of 330 V, 50 Hz, the eddy current loss will be

(A) 168.75 W   (B) 112.5 W   (C) 75 W   (D) 50 W

13. A synchronous condenser used for the power factor correction is
    (A) an over excited synchronous motor at full load.
    (B) an over excited synchronous generator at full load.
    (C) an induction motor at light load.
    (D) an over excited synchronous motor at no load.

14. A D.C. shunt motor is running at 1200 RPM, when excited with 220 V D.C. neglecting the losses and saturation, the speed of the motor when connected 175 V D.C. supply will be

(A) 750 RPM   (B) 900 RPM   (C) 1650 RPM   (D) 1200 RPM

15. When the electric train is moving down a hill, the d.c. motor acts as a
    (A) d.c. series motor   (B) d.c. shunt motor
    (C) d.c. series generator   (D) d.c. shunt generator

16. A synchronous motor operates at 0.8 pf lagging. If the field current of the motor is continuously increased
    (A) the power factor decreases upto a certain value of field current and thereafter it increases.
    (B) the armature current increases upto a certain value of field current and thereafter it decreases.
    (C) the power factor increases upto a certain value of field current and thereafter it decreases.
    (D) the armature current decreases upto a certain value of field current and thereafter it increases.

17. During hunting of synchronous motor
    (A) negative phase sequence current are generated.
    (B) harmonics are developed in the armature circuit.
    (C) damper bar develops torque.
    (D) field excitation increases.

18. Which of the following equipment needs a motor of least rating ?
    (A) Electric clock   (B) Sewing machine
    (C) Table fan   (D) Mixer-grinder

19. Vacuum cleaners use
    (A) permanent magnet f.h.p. motors
    (B) single-phase capacitor motor with direct-on-line start
    (C) reluctance motor
    (D) universal motor

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20. Slip test is performed to determine

    (A) slip

    (B) direct axis reactance and quadrature axis reactance

    (C) positive sequence reactance and negative sequence reactance

    (D) sub-transient reactance

21. The impulse response of an R-L circuit is a

    (A) rising exponential function   (B) decaying exponential function

    (C) step function   (D) parabolic function

22. For what values of 'a', does the system shown in figure have a zero steady state error ?
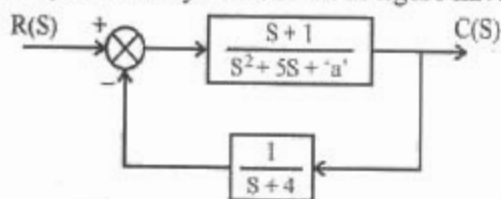
    (A) $a \neq 0$ (B) $a = 0$ (C) $a \geq 4$ (D) $a \geq 9$

23. A system has the following transfer function :

    $$G(s) = \frac{100\,(s+5)\,(s+50)}{s^4(s+10)\,(s^2+3s+10)}.$$

    The type and order of the system are respectively

    (A) 4 and 9   (B) 4 and 7   (C) 5 and 7   (D) 7 and 5

24. The value of a matrix $\dot{X} = AX$ for the system described by the differential equation $\ddot{y} + 3\dot{y} + 2y = 0$ is

    (A) $\begin{bmatrix} 1 & 0 \\ -2 & -1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ -1 & -2 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 \\ -3 & -2 \end{bmatrix}$

25. Consider the following statements regarding a linear system :

    1. $f(x_1 + x_2) = f(x_2) + f(x_1)$

    2. $f[x(t + T)] = f[x(t)] + f[x(T)]$

    3. $f(kx) = kf(x)$

    Of these statements,

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

    (C) 3 alone is correct.   (D) 1 and 3 are correct.

26. For a system having transfer function $P(s) = \dfrac{2}{s+2}$ the gain for $\omega = 2$ will be

    (A) 0.707   (B) 0.666   (C) 0.5   (D) 0.25

27. A servo-mechanism with unit step input can be categorized by
   (A) Type 3 system
   (B) Type 2 system
   (C) Type 1 system
   (D) Type 0 system

28. A chemical reactor with input flow u(f) and output concentration j(f) is modelled as a linear system with impulse response $h(f) = (4 + 8t)e^{-2t}$ for $t \geq 0$. The slope in Bode plot is expressed as (per unit change in low ω)
   (A) 0 dB/octave
   (B) 6 dB/octave
   (C) −6 dB/octave
   (D) −10 dB/octave

29. Which of the following transfer function has non-minimum phase function ?
   (A) $G(s) = \dfrac{s+1}{(s+2)(s+3)}$
   (B) $\dfrac{(s+1)(s+2)}{s(s+4)(s+5)}$
   (C) $G(s) = \dfrac{(s-1)}{s(s+1)(s+3)}$
   (D) None of the above

30. Closed loop systems are _____ stable and _____ accurate as compared to open loop system.
   (A) less, more
   (B) more, less
   (C) less, less
   (D) more, more

31. The powers output from an hydro-electric power plant depends on
   (A) type of dam, type of catchment area and discharge
   (B) type of dam, head and system efficiency
   (C) discharge head and system efficiency
   (D) type of turbine, type of dam and type of catchment area

32. In India pumped storage plants
   (A) does not exist at all
   (B) exist in Rajasthan alone
   (C) exists in Kadampurai (TN)
   (D) exists in Haryana

33. The topmost wire in a distribution line is
   (A) a neutral wire
   (B) earth wire
   (C) phase wire
   (D) anyone of these

34. Temperature increase produces the following effect on a transmission line.
   (A) Tension of the conductor and its sag increase.
   (B) Tension of the conductor and its sag decrease.
   (C) Tension of the conductor decreases and its sag increases.
   (D) Tension of the conductor increases and its sag decreases.

35. An ACSR conductor having 7 steel strands and 24 aluminium conductors surrounding the steel strand is called
   (A) 24/7 ACSR
   (B) 7/24 ACSR
   (C) 41/7 ACSR
   (D) 7/31 ACSR

36. Match List – I (Relays) with List – II (Protection) and select the correct answer using the codes given below the lists :

	List – I (Relays)		List – II (Protection)
a.	Buchholz relay	1.	Feeder
b.	Translay relay	2.	Transformer
c.	Carrier current phase comparison relay	3.	Ring main distributors
d.	Directional over current relay	4.	Long overhead transmission line

Codes :

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

37. Which of the following equipments is installed in steam power plants to reduce air pollution ?
    (A) De-super heater
    (B) Air filter
    (C) Air electrostatic precipitator
    (D) Stock

38. Shunt reactors are connected with transmission lines for
    (A) limiting fault current
    (B) limiting fault voltage
    (C) absorbing reactive power
    (D) absorbing high voltage surges

39. The function of the earthwire in an extra high voltage line is to
    (A) prevent earth fault
    (B) provide a safety measure for any high flying object
    (C) provide a shield to the phase conductors from direct lightning stroke
    (D) provide mechanical strength to the towers

40. A 30 km transmission line carrying power at 33 kV is known as
    (A) short transmission line
    (B) long transmission line
    (C) high power line
    (D) ultra high voltage line

41. The rate of rise of restriking voltage depends upon the
    (A) type of circuit breaker
    (B) inductance of the system only
    (C) capacitance of the system only
    (D) inductance and capacitance of the system

42. The voltage appearing across the contacts after the opening of the circuit breaker is called
    (A) surge voltage
    (B) recovery voltage
    (C) arc voltage
    (D) break open voltage

43. The medium used for arc extinction in air CB is
    (A) SF$_6$
    (B) air
    (C) compressed air
    (D) oil

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44. Grounding is done generally at
    (A) receiving end
    (B) supply end
    (C) either at receiving end or at supply end
    (D) None of these

45. In the single line diagram shown in figure, the fault occurs nearer to the generator. The magnitude of fault current nearer to the generator is _____ and the magnitude of fault current far away to the generator is _____.
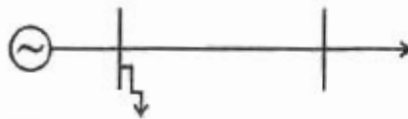

    (A) maximum, minimum   (B) minimum, maximum
    (C) minimum, minimum   (D) maximum, maximum

46. Over current protection responds to
    (A) increase in current above pick-up value
    (B) single line to earth faults
    (C) double line to earth faults
    (D) all of the above

47. Directional over current relay is used for protection of
    (A) long transmission line   (B) large power transformer
    (C) ring main distribution line   (D) radial distribution line

48. Inverse time-current relays are used for the protection of
    (A) feeders   (B) transformers
    (C) alternators   (D) both (A) and (B)

49. Earth fault relays are
    (A) directional relays   (B) non-directional relays
    (C) short operate time relays   (D) none of these

50. The most common type of protection used for stator winding faults such as phase to phase or phase to ground short-circuit in case of alternators is
    (A) Over-current protection   (B) Merz-Price protection
    (C) Buchholz protection   (D) None of the above

51. Consider a second order system with $\dot{X} = AX + BU$, where the eigen vectors are given by $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$ respectively, for the $B = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$. The matrix A is given by

    (A) $A = \begin{pmatrix} -3 & 0 \\ 0 & -5 \end{pmatrix}$ (B) $A = \begin{pmatrix} 0 & 1 \\ -15 & -8 \end{pmatrix}$

    (C) $A = \begin{pmatrix} -3 & 1 \\ 0 & -5 \end{pmatrix}$ (D) $A = \begin{pmatrix} -3 & 1 \\ 1 & -5 \end{pmatrix}$

52. In an op-amp series voltage regulator, output voltage depends on
   (A) Zener voltage
   (B) Voltage divider resistors
   (C) Output voltage
   (D) Both (A) and (B)

53. The diode which is often used for voltage regulation in electronic circuits is called _____ diode.
   (A) Zener
   (B) Varactor
   (C) Silicon
   (D) Germanium

54. Ga As, LEDs emit radiation in the
   (A) ultraviolet region
   (B) violet-blue green range of the visible region
   (C) visible region
   (D) infra-red region

55. The main use of an emitter follower is as
   (A) power amplifier
   (B) impedance matching device
   (C) low-input impedance circuit
   (D) follower of base signal

56. For an ideal noise free transistor amplifier the noise factor is
   (A) zero
   (B) zero dB
   (C) 1 dB
   (D) depends on other factors

57. The negative feedback is an amplifier
   (A) lowers its lower 3 dB frequency
   (B) raises its upper 3 dB frequency
   (C) increase its bandwidth
   (D) All of the above

58. The dc-load line of a transistor circuit
   (A) has a negative slope
   (B) is a curved line
   (C) gives graphic relation between I_C and I_B
   (D) does not contain the Q-point

59. Using an LC filter the ripple factor of a full wave rectifier
   (A) increase with load current
   (B) increase with the load resistance
   (C) remains constant with the load current
   (D) Both (B) and (C)

60. The leakage energy of current of a P-N diode is caused by
   (A) heat energy
   (B) chemical energy
   (C) barrier potential
   (D) majority carrier

61. The minimum number of NAND gates required to implement the Boolean function

   $A + A\bar{B} + A\bar{B}C$ is equal to
   (A) zero
   (B) 1
   (C) 4
   (D) 7

62. A certain JKFF has tpd = 12 ns. The largest MOD counter that can be constructed from these FFs and still operate upto 10 MHz is
   (A) Any
   (B) 8
   (C) 256
   (D) 10

63. A pulse train can be delayed by a finite number of clock periods using
   (A) a serial-in serial-out shift register
   (B) a serial-in parallel-out shift register
   (C) a parallel-in serial-out shift register
   (D) a parallel-in parallel-out shift register

64. The output y of the circuit shown in the figure is
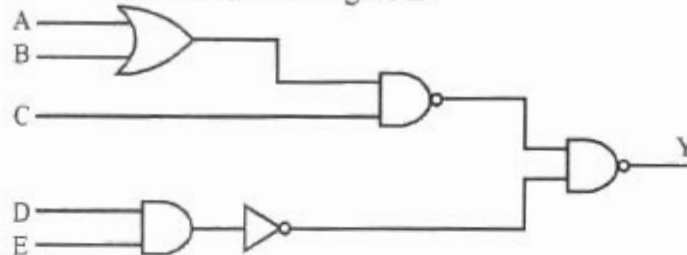
   (A) $(A + B) C + DE$
   (B) $AB + C (D + E)$
   (C) $(A + B) C + D + E$
   (D) $(A + B) C \cdot DE$

65. The decimal equivalent of the hexadecimal number $(3 E8)_{16}$ is
   (A) 1000   (B) 982   (C) 768   (D) 323

66. A combinational circuit is one in which the output depends on the
   (A) input combination at that time
   (B) input combination and the previous output
   (C) input combination at that time and the previous input combination
   (D) present output and the previous output

67. A divide by 78 counter can be realized by using
   (A) 6 nos. of mod-13 counters
   (B) 13 nos. of mod-13 counters
   (C) one mode-13 counter followed by one mod-6 counter
   (D) 13 nos. of mod-6 counters

68. The initial state of MOD-16 down counter is 0110. What state will it be after 37 clock pulses ?
   (A) Indeterminate   (B) 0110
   (C) 0101   (D) 0001

69. A switch tail ring counter is made by using a single D flipflop. The resulting circuit is a
   (A) SR flipflop   (B) JK flipflop
   (C) D flipflop   (D) T flipflop

70. The complement of the Boolean expression $AB \cdot (\bar{B}C + AC)$ is
   (A) $(\bar{A} + \bar{B}) + (B + \bar{C}) \cdot (\bar{A} + \bar{C})$
   (B) $(\bar{A} \cdot \bar{B}) + (B\bar{C} + \bar{A}\bar{C})$
   (C) $(\bar{A} + \bar{B}) \cdot (B + \bar{C}) (\bar{A} + \bar{C})$
   (D) $(A + B) \cdot (\bar{B} + C) (A + C)$

71. A constant K low pass T section filter has a characteristic impedance of 600 Ohms at zero frequency. At $f = f_c$, the characteristic impedance will be
   (A) 600 Ohms   (B) more than 600 Ohms
   (C) zero   (D) infinite

72. A constant K high pass filter has a cutoff frequency of 3000 Hz. At a frequency of 1000 Hz, the phase shift is

(A) Zero   (B) $-\pi$ (C) 2π (D) more than π

73. The function $\dfrac{(s+2)\,(s+4)}{(s+1)\,(s+3)}$

(A) is a reactance function

(B) may be a reactance function or an RC function

(C) is an RC function

(D) may be RC function or an RL function

74. An RL impedance function z(s) is to be synthesised in second foster form. The proper function to be expanded is

(A) z(s)   (B) $s \cdot z(s)$ (C) $\dfrac{1}{z(s)}$ (D) z(s)/s

75. For stable networks, the real part of the poles and zeros of the driving point function must be

(A) negative   (B) negative or zero

(C) positive   (D) zero

76. A HP filter Fe = 2 kHz and R = 2 kΩ. Its designed value of $\angle$ will be

(A) 0.15915 H   (B) 159.15 mH

(C) either (A) or (B)   (D) 159.15 μH

77. An LCR type BSF has R = 1 kΩ, L = 115 mH and C = 400 PF. Its resonance frequency will be

(A) 2.05 kHz   (B) 20.50 kHz

(C) 2.05 MHz   (D) 4.10 MHz

78. The cut off frequency of an LPF with RC configuration is 500 Hz. Its R = 500 Ω, the value of C will be

(A) 636.6 nF   (B) 63.66 pF

(C) 63.66 μF   (D) 63.66 mF

79. Which of the following is true for a three phase delta connected circuit ?

(A) Line voltage = Phase voltage $\times \sqrt{3}$ (B) Line current = Phase current

(C) Line voltage = $\dfrac{1}{\sqrt{3}}$ Phase voltage   (D) Line current = $\sqrt{3}$ Phase current

80. According to the final value theorem

(A) $F(0^-) = \lim SF(s)\,\delta \to \infty$ (B) $F(0^+) = \lim SF(s)\,\delta \to \infty$

(C) $F(\infty) = \lim SF(s)\,\delta \to 0$ (D) None of them

81. Creeping in a single phase Induction type energy meter may be due to
    (A) overcompensation for friction
    (B) over voltage
    (C) vibrations
    (D) All of the above

82. Phantom loading for testing of energy meters is used
    (A) to isolate the current and potential circuits
    (B) to reduce power loss during testing
    (C) for meters having low current ratings
    (D) to test meters having a large current for which loads may not be available in the laboratory. This also reduces power losses during testing.

83. In an induction type energy meter, compensation for static friction is provided by
    (A) shading bands which are actuated to provide a constant torque irrespective of load
    (B) lag circuits
    (C) drilling holes in the disc
    (D) None of the above

84. Turns compensation is used in current transformers primarily for reduction of
    (A) phase angle error
    (B) both ratio and phase angle errors
    (C) ratio error, reduction in phase angle error is incidental
    (D) None of the above

85. The ratio and phase angle errors in potential transformers may be reduced by
    (A) increasing the exciting current
    (B) increasing the resistance and leakage reactance in the transformer
    (C) not employing turns compensation
    (D) None of the above

86. In an electrodynamometer type of wattmeter
    (A) the current coil is made fixed
    (B) the pressure coil is fixed
    (C) any of the two coils (i.e.) current coil or pressure coil can be made fixed
    (D) both the coils should be movable

87. Which type of wattmeter cannot be used for D.C ?
    (A) Electrostatic type
    (B) Dynamometer type
    (C) Induction type
    (D) None of the above

88. A ballistic galvanometer is used for the measurement of
    (A) Voltage   (B) Current   (C) Frequency   (D) Electrical charge

89. Which is the integrating instrument ?
    (A) Voltmeter   (B) Wattmeter   (C) Energy meter   (D) Power factor meter

90. In a megger when not in operation, the needle shows a resistance of
    (A) zero Ohms   (B) 100 Ohms   (C) 555 Ohms   (D) Infinity

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91. A random noise generator produces a signal
    (A) whose amplitude varies randomly
    (B) which has no periodic frequency
    (C) has an unpredictable power spectrum
    (D) All the above

92. In a Q meter, distributed capacitance of coil is measured by changing the capacitance of the tuning capacitor. The values of tuning capacitor are C_1 and C_2 for resonant frequencies f_1 and $2f_1$ respectively. The value of distributed capacitance is
    (A) $C_1 - C_2/2$ (B) $C_1 - 2C_2/3$ (C) $C_1 - 4C_2/3$ (D) $C_1 - 3C_2/2$

93. In a differential amplifier using two FETs a resistance has to be used to reduce the meter current to zero even when no voltage is applied to the circuit. This is necessitated on account of
    (A) mismatch between characteristics of the FETs
    (B) difference between tolerance values of resistors used in the circuit even though they are marked nominally equal
    (C) variations in the operating voltage of the circuit
    (D) Both (A) and (B)

94. The pulse rise time is defined as the time taken by the pulse
    (A) to go from 10% to 90% of its amplitude
    (B) to go from 0% to 100% of its amplitude
    (C) to go from 0% to 90% of its amplitude
    (D) to go from 10% to 100% of its amplitude

95. The duty cycle of a pulse shown in Fig. is

    30 μs   90 μs

    0
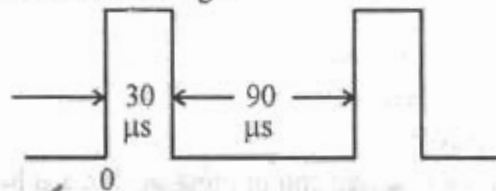
    (A) 33%   (B) 25%   (C) 300%   (D) 75%

96. In a source follower type electronic volt meter, the transconductance of FETs is 0.005 mho and the resistance of the meter is 100 Ω. The approximate value of current through the meter, when the input voltage is 1 V, is
    (A) 2.5 mA   (B) 5 mA   (C) 2 mA   (D) 1 mA

97. The source of emission of electrons in a CRT is
    (A) PN function diode   (B) a barium and strontium oxide coated diode
    (C) accelerating anodes   (D) post-accelerating anodes

98. The Q factor of a coil at the resonant frequency 1.5 MHz of an RLC series circuit is 150. The bandwidth is
    (A) 225 MHz   (B) 1.06 MHz   (C) 10 kHz   (D) None of the above

99. The switching time of LEDs is of the order of
    (A) 1 s
    (B) 1 ms
    (C) 1 μs
    (D) 1 ns

100. In circuit of RF voltmeters
    (A) vacuum tube diodes are used
    (B) conventional PN Junction diodes are used
    (C) Schottky barrier or point contact type diodes are used
    (D) All of the above

101. Random Errors are otherwise known as
    (A) Residual Errors
    (B) Gross Error
    (C) Threshold Error
    (D) Instrumental Error

102. A set of readings has a wide range and therefore it has
    (A) Low precision
    (B) High precision
    (C) Low accuracy
    (D) High accuracy

103. The error due to hysteresis in moving iron type instruments is minimised by using
    (A) Stainless Steel
    (B) High speed Steel
    (C) Silver Coating
    (D) Primalley

104. An example of absolute instrument is
    (A) Voltmeter
    (B) Tangent Galvanometer
    (C) Thermometer
    (D) Pressure Gauge

105. If noise factor is expressed in decibels, it is known as
    (A) Signal to Noise Ratio
    (B) Noise Figure
    (C) Standard Noise
    (D) Source Noise

106. The transfer function of a compensator is given as $G(s) = \dfrac{s+p}{s+q}$: G(s) is a lead compensator if,
    (A) p = 1 and q = 2
    (B) p = 3 and q = 2
    (C) p = -3 and q = -1
    (D) p = 3 and q = 1

107. A second order underdamped system has a damping factor of 0.8 . It is subjected to a sinusoidal input of unit amplitude. It has resonant peak of
    (A) 108 %
    (B) 92 %
    (C) 20 %
    (D) It has no resonant peak

108. A 0-300 V voltmeter has an error of ± 2 % of full scale deflection. What would be the range of readings if true voltage is 30 V ?
    (A) 24 V – 36 V
    (B) 29.4 V – 30.6 V
    (C) 20 V to 40 V
    (D) None of the above

109. A first order system has a time constant of 20 S. It is subjected to a step input. The settling time of the output is assumed to be the time it reaches 95 % of its final steady state value. The settling time of the system is
    (A) 100 S
    (B) 60 S
    (C) 20 S
    (D) Infinity

110. The below shown diagram is an example of
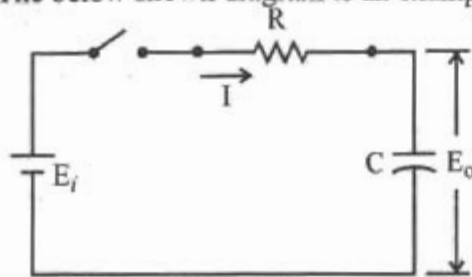
(A) Zero order system
(B) First order system
(C) Second order system
(D) Both (A) and (B)

111. Dunmore hygrometer has
(A) Linear resistance / relative humidity characteristics.
(B) Non-linear resistance / relative humidity characteristics.
(C) Linear inductance / relative humidity characteristics.
(D) Non-linear inductance / relative humidity characteristics.

112. Capacitive transducers are normally used for
(A) Static measurement
(B) Dynamic measurement
(C) Both static and dynamic measurement
(D) Transient measurements

113. Piezo-electric transducers are
(A) passive transducers
(B) active transducers
(C) both active and passive transducers
(D) none of the above

114. Semi conductor strain gauges have
(A) low fatigue life
(B) complete linearity
(C) high gauge factor
(D) poor hysteresis characteristics

115. The microphones which are widely used for sound measurement systems having a very wide range of amplitudes are
(A) Carbon Microphones
(B) Piezo electric Microphones
(C) Inductive Microphones
(D) Capacitive Microphones

116. An L.V.D.T.
(A) exhibits linear characteristics upto a displacement of $\pm$ 5 mm
(B) has a linearity of 0.05 %
(C) has an infinite resolution and a high sensitivity which is the order of 40 V/mm
(D) all of the above

117. The dynamic characteristics of capacitive transducers are similar to those of
(A) low pass filters
(B) high pass filters
(C) notch filters
(D) band stop filters

118. In a resistance potentiometer high value of resistance of POT leads to
(A) high value of sensitivity
(B) low value of sensitivity
(C) low value of non-linearity
(D) low value of error

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119. A diaphragm has a natural frequency of 30 kHz. If both its diameter and thickness are halved, the natural frequency is
   (A) 15 kHz   (B) 240 kHz   (C) 60 kHz   (D) 120 kHz

120. An accelerometer has a damping ratio of 0.7. To obtain steady relative displacement to amplitude of input displacement as 0.99 or error of 1 %, the value of frequency ratio will be
   (A) 1.25   (B) 2.00   (C) 2.45   (D) 5.00

121. The limitations on use of strain gauges at high temperatures is due to
   (A) deterioration of grid material
   (B) use of weldable type gauges
   (C) decomposition of cement and carrier materials
   (D) use of flame spraying

122. Low resolution devices for measurement of length have a resolution of the order of
   (A) 25×10^{-6} mm   (B) 0.25 mm
   (C) 2.5×10^{-3} mm   (D) none of the above

123. Hoop stress act
   (A) in radial direction   (B) in axial direction
   (C) in both radial and axial direction   (D) none of the above

124. An average human being, with his finger tips, can sense vibrations of sinusoidal nature having an amplitude as low as
   (A) 3 mm   (B) 0.3 mm   (C) 0.3 µm   (D) 100 µm

125. A potentiometric type accelerometer can be used for measurement of vibrations of frequencies
   (A) lower than 50 Hz   (B) higher than 1 kHz
   (C) higher than 10 kHz   (D) from 100 Hz and higher

126. Very small forces of the order of 1N can be easily measured with
   (A) an hydraulic load cell   (B) pneumatic load cell
   (C) elastic force technique   (D) balance type systems

127. For dynamic force measurement one always prefers
   (A) a piezo-electric type load cell   (B) a strain gauge load cell
   (C) a pneumatic load cell   (D) an hydraulic load cell

128. Electromagnetic type of balances
   (A) are more sensitive to environmental effects.
   (B) are of large size and have slow response.
   (C) cannot be operated from a remote location.
   (D) give an output which cannot be used for recording and control.

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129. Vibration measurement and control is important because it
    (A) causes damage to the structure
    (B) creates noisy surrounding
    (C) affects seriously human hearts
    (D) has no serious objection

130. Extremely small motion can be measured with
    (A) seismic type accelerometer
    (B) a pneumatic motion transducer
    (C) piezo-electric type transducer
    (D) an optical interferrometric type sensor

131. Variable head flow meters can be used for measurements of flows of
    (A) Liquids only
    (B) Liquids and Gases
    (C) Slurries only
    (D) Liquid, Gases and Slurries

132. The Reynold's number for flow in a pipe is given by
    (A) vd μ/p
    (B) vdp/μ
    (C) vd/pμ
    (D) vpμ/d

133. A manometer has a damping factor of 0.3. Suppose the volume of the manometer is halved, its damping factor will be
    (A) 0.3
    (B) 0.15
    (C) 0.6
    (D) 0.42

134. Velocity pressure is difference of
    (A) dynamic pressure and static pressure
    (B) stagnation pressure and static pressure
    (C) Impact pressure and dynamic pressure
    (D) Impact pressure and stagnation pressure

135. Vacuum pressure is
    (A) equal to gauge pressure
    (B) equal to atmospheric pressure
    (C) lower than atmospheric pressure
    (D) equal to absolute pressure

136. In thermal conductivity gauges, the major source of error is heat loss on account of
    (A) radiation
    (B) conduction
    (C) convection
    (D) both conduction and radiation

137. A first order thermometer has a time constant of 50s. It is subjected to a sinusoidal input cycling at 0.002 Hz. The time lag of the instrument is
    (A) 50s
    (B) 44.6s
    (C) 500s
    (D) 0.01s

138. A thermocouple instrument cannot have
    (A) high sensitivity
    (B) small power loss
    (C) no frequency error
    (D) controlling force

139. The meter which is suitable for flow totalization is
    (A) turbine meter
    (B) venturi meter
    (C) ultrasonic flowmeters
    (D) orifice place

140. Which of the following flow meter is capable of measuring the rate of flow as well as totalized flow ?
    (A) Nutating disc flow meter
    (B) Electromagnetic flow meter
    (C) Orifice meter
    (D) Lobed impeller flow meter

141. For an ideal Newtonian fluid, the relationship is
    (A) μ = shear stress/velocity gradient
    (B) μ = velocity gradient / shear stress
    (C) μ = velocity / stress
    (D) μ = stress / velocity

142. In a say balt viscometer, the viscosity can be used for measuring the time to fill a flask with liquid volume equal to
    (A) 50 ml
    (B) 200 ml
    (C) 60 ml
    (D) 10 ml

143. A saybolt viscometer is used for measurement of viscosity of a motor oil. The time recorded for 60 ml drainage is 183 s. Calculate the kinematic viscosity.
    (A) $v = 3.928 \times 10^{-6}$ m²/s
    (B) $v = 392.8 \times 10^{-6}$ m²/s
    (C) $v = 39.28 \times 10^{-4}$ m²/s
    (D) $v = 39.28 \times 10^{-6}$ m²/s

144. Unit of density is
    (A) kg/m³
    (B) g/m³
    (C) kg/m²
    (D) kg/m

145. The rate of flow of fluid depends upon
    (A) density
    (B) gravity force
    (C) viscosity
    (D) all the above

146. One of the following is not used for measurement of density :
    (A) Manometer
    (B) Hydrometer
    (C) Force balance method
    (D) Both (B) and (C)

147. The potential drop across pH meter is
    (A) $\Delta v_i = -2.30 \dfrac{RT}{\xi} \log \dfrac{C_H}{C_R}$
    (B) $\Delta v_i = 2.30 \dfrac{RT}{\xi} \log \dfrac{C_H}{C_R}$
    (C) $\Delta v_i = 2.30 \dfrac{RT}{\xi} \log \dfrac{C_R}{C_H}$
    (D) $\Delta v_i = 1.65 \dfrac{RT}{\xi} \log \dfrac{C_R}{C_H}$

148. pH value of a solution is defined
    (A) $pH = -\log_{10}(H^+)$
    (B) $pH = +\log_{10}(H^+)$
    (C) $pH = -\log_{10}(OH^-)$
    (D) $pH = -\log_{10}(H^-)$

149. The dissociation constant is the product of H^+ ions and OH^- ions and this product is always equal to
    (A) 10^{-16}
    (B) 10^{-14}
    (C) 10^{-12}
    (D) 10^{-15}

150. A solution which has a pH value of more than 7 is
   (A) neutral in nature
   (B) acidic in nature
   (C) alkaline in nature
   (D) can be either acidic or alkaline in nature

151. Z-transform of unit impulse function is
   (A) 1
   (B) Z
   (C) $\frac{1}{Z}$
   (D) $\frac{1}{Z^2}$

152. In Ratio Control Wild stream refers to
   (A) Controllable stream
   (B) Uncontrollable stream
   (C) Both controllable and uncontrollable stream
   (D) None of the above

153. The transfer function of a basic PID controller is given by (K's are real constants)
   (A) $K_0 + \frac{K_1}{S} + K_2 S$
   (B) $K_0 + K_2 S$
   (C) $K_1 S + K_2 S$
   (D) $K_0 + \frac{K_1}{S}$

154. For a temperature control process, which control action is best suited ?
   (A) On/Off control action
   (B) Proportional control action
   (C) Proportional-integral control action
   (D) Proportional-integral derivative control

155. Which of the following is a discontinuous control action ?
   (A) Proportional control action
   (B) Integral control action
   (C) Derivative control action
   (D) On/Off control action

156. Which of the following is not true for a feed forward control action ?
   (A) It is good for slow systems
   (B) It is sensitive to process parameter variations.
   (C) It can cope with unmeasured disturbances.
   (D) It requires good knowledge of the process model.

157. The valve characteristics, where full flow is achieved with a relatively short movement of stem is, in
   (A) linear
   (B) equal percentage
   (C) quick opening
   (D) none of the above

158. In case of an On/Off controller, the proportional band is
   (A) 100%
   (B) 50%
   (C) 25%
   (D) 0

159. The main advantage of combining integral control action to proportional control action is
   (A) Maximum overshoot
   (B) Elimination of offset
   (C) Short recovery time
   (D) None of the above

160. Which of the following control action is referred to as Reset Control action ?
   (A) Proportional control action   (B) Derivative control action
   (C) Integral control action   (D) On/Off control action

161. The use of Korotkoff sounds is the indirect indicator of blood pressure is called
   (A) Occlusion   (B) Auscultation
   (C) Palpation   (D) Flush

162. To reduce common mode interference during recording to bio signals one can use
   (A) Buffer amplifier   (B) Differential amplifier
   (C) Single ended amplifier   (D) Chopper amplifier

163. The brain waves with frequencies between 8 and 13 Hz and a mean amplitude of 50 μv are called
   (A) Spike and waves due to Epilepsy   (B) Delta waves
   (C) Theta waves   (D) Alpha waves

164. Isolation amplifier is used to isolate patient from
   (A) Electrodes   (B) Electrical appliance
   (C) Biomedical equipment   (D) Doctor

165. For a biosignal amplifier CMRR should be
   (A) Minimum   (B) Maximum   (C) Zero   (D) Infinity

166. An endoscope is an instrument for examining
   (A) a body cavity   (B) the cancer cells
   (C) blood flow rates   (D) the head surfaces

167. Doppler pulsed blood flowmeter functions at a frequency range from
   (A) 2 to 10 MHz   (B) 11 to 15 MHz
   (C) 16 to 20 MHz   (D) 21 to 25 MHz

168. Neuronal action potentials can be measured with
   (A) Macro Electrodes   (B) Needle Electrodes
   (C) Micro Electrodes   (D) Surface Electrodes

169. Cardiac output is defined as where V = stroke volume and R = Heart rate
   (A) R/V   (B) V/R   (C) RV   (D) R – V

170. For clinical electromyography the electrode used is
   (A) Surface Electrodes   (B) Film Electrodes
   (C) Floating Electrodes   (D) Needle Electrodes

171. A superheterodyne receiver has a IF of 465 kHz. If it is tuned to a station broadcasting at 500 kHz and its oscillator is operating at 965 kHz., then the 1430 kHz frequency would be the
(A) Adjacent channel frequency
(B) Image frequency
(C) Gyro frequency
(D) Maximum usable frequency

172. Match List – I (Modulation) with List – II (Characteristic) and select the correct answer using the codes given below the lists :

List – I		List – II
(a)	AM	1. Mobile communication
(b)	FM	2. Constant carrier frequency
(c)	Noise in FM	3. Triangular noise power spectrum
(d)	Noise in AM and FM	4. Rectangular noise power spectrum

Codes :

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

173. In a modulation system, on doubling the modulation frequency, the modulation index gets halved while the modulating voltage needed remains unaltered. The modulation system is
(A) AM
(B) FM
(C) PM
(D) Any of the above three

174. Increased pulse width in the flat-top sampling leads to
(A) Attenuation of high frequencies in reproduction.
(B) Attenuation of low frequencies in reproduction.
(C) Greater aliasing errors in reproduction.
(D) No harmful effects in reproduction.

175. The unit impulse response of a unity feedback control is given by $C(t) = -t\,e^{-t} + 2e^{-t}$, $(t \geq 0)$. The open loop transfer function is equal to
(A) $\dfrac{s+1}{(s+2)^2}$
(B) $\dfrac{2s+1}{s^2}$
(C) $\dfrac{s+2}{(s+1)^2}$
(D) $\dfrac{s+1}{s^2}$

176. Consider the following statements :
1. The bandwidth of the A.M. wave depends on the bandwidth of the modulating signal.
2. The bandwidth of the A.M. wave depends on the modulation index.
3. The bandwidth of F.M. waves for all practical purposes depends on the modulation frequency.
4. The bandwidth of the F.M. wave, for all practical purposes depends on the amplitude of the carrier.

Of these statements,
(A) 1 and 2 are correct
(B) 1 and 3 are correct
(C) 1 and 4 are correct
(D) 2 and 4 are correct

177. If carrier modulated by a digital bit stream had one of the possible phases of 0, 90, 180 and 270 degrees, then the modulation is called
(A) BPSK (B) QPSK (C) QAM (D) MSK

178. Microwave link repeaters are typically 50 km apart in TV transmission because
(A) of atmospheric attenuation
(B) of output power tube limitations
(C) microwave transmission is through surface wave which attenuates faster
(D) of earth's curvature

179. A satellite carrying antenna system, transmitter, receiver and power supply is known as
(A) Geostationary satellite (B) Orbital satellite
(C) Active satellite (D) Passive satellite

180. A PAM signal can be detected by using
(A) an ADC (B) an integrator
(C) a band pass filter (D) a high pass filter

181. The interface chip used for data transmission between 8086 and a 16-bit ADC is
(A) 8259 (B) 8255 (C) 8253 (D) 8251

182. The TRAP is one of the interrupts available in INTEL 8085. Which one of the following statements is true of TRAP ?
(A) It is level triggered.
(B) It is negative edge triggered.
(C) It is positive edge triggered.
(D) It is both positive edge triggered and level triggered.

183. In 8085 microprocessor system, the direct addressing instructions is
(A) MoV A, B (B) MoV B, OA H
(C) MoV C, M (D) STA adds

184. A ROM is used to store the table for multiplication of two 8-bit unsigned integers. The size of ROM required is
(A) 256 K × 16 (B) 64 K × 8 (C) 4 K × 16 (D) 64 K × 16

185. The following program is run on an 8085 microprocessor :

Memory Address index	Instruction
2000	L X 1 SP, 1000
2003	PUSH H
2004	PUSH D
2005	Call 2050
2008	POP H
2009	HLT

At the completion of execution of the program, the program counter of the 8085 contains _____ and the stack pointer contains _____ .
(A) 2050, OFFC (B) 2020, OCCF (C) 2000, CCFO (D) 2020, OFFC

186. In a generic microprocessor, instruction cycle time is
    (A) shorter than machine cycle time.
    (B) larger than machine cycle time.
    (C) exactly double the machine cycle time.
    (D) exactly the same as the machine cycle time.

187. The stack pointer in the 8085 microprocessor is a
    (A) 16 bit register that point to stack memory locations
    (B) 16 bit accumulator
    (C) memory location in the stack
    (D) flag register used for the stack

188. Match List – I (Request) with List – II (Device) and select the correct answer using the codes given below the lists :

         List – I   List – II
    (a) Interrupt   1.   I/O device
    (b) Wait   2.   DMA controller
    (c) HOLD   3.   Memory

    Codes :
          (a)   (b)   (c)
    (A)   1   2   3
    (B)   1   3   2
    (C)   2   1   3
    (D)   2   3   1

189. An 'Assembler' for a microprocessor is used for
    (A) Assembly of processors in a production line
    (B) Creation of new programmes using different modules
    (C) Translation of a program from assembly language to machine language
    (D) Translation of a higher level language into English text

190. In a 8085 microprocessor, the following sequence of instructions is executed :
        STC
        CMC
        MoV A, B
        RAL
        Move B, A
    After the last instruction, the output will
    (A) rotate the contents of the accumulator and store it in B
    (B) get the contents of B-register into accumulator and rotate it to left by one bit
    (C) double contents of B register
    (D) manipulate carry in A and B

191. Which of the following is not true for a PLC ?
    (A) It is small in size   (B) It has higher power consumption
    (C) It offers solid state reliability   (D) It is easily expandable

192. A supervisory control has been applied in chemical process to
    (A) minimize operating cost
    (B) maximize production profit
    (C) maximize efficiency in raw material utilization
    (D) all of the above

193. Which Boolean expression suited for the following ladder logic diagram ?
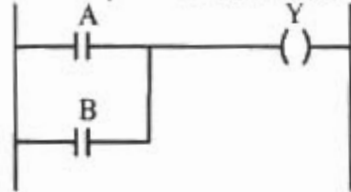
    (A) $Y = A + B$ (B) $Y = A \cdot B$ (C) $Y = \overline{A + B}$ (D) $Y = \overline{A \cdot B}$

194. In PLC, GET instruction is referred as
    (A) Data transfer instruction
    (B) Data comparison instruction
    (C) Data manipulation instruction
    (D) None of the above

195. The two methods commonly used to represent a timer within a PLC's logic ladder program are
    (A) Coil and block format   (B) Coil and contact format
    (C) Block and contact format   (D) None of the above

196. Bandwidth of audio transmission is
    (A) 30 to 300 Hz   (B) 3 to 30 Hz
    (C) 300 to 3000 Hz   (D) None of the above

197. HART is abbreviated form of
    (A) Highway Addressable Remote Transistor
    (B) Highway Addressable Remote Transducer
    (C) Highway Addressable Resistance and Transistor
    (D) Heavy Address Row Transmission

198. The standard current signal used for transmission in DCS
    (A) (3 – 30) mA   (B) (2 – 20) mA   (C) (4 – 20) mA   (D) (1 – 10) mA

199. The standard signal used for signal transmission in terms of pressure
    (A) (2 – 20) psi   (B) (3 – 15) psi   (C) (1 – 10) psi   (D) (2 – 15) psi

200. Which type of communication is used in HART ?
    (A) 3 tier   (B) master/slave
    (C) multidrop   (D) data transmission