

PART III — 4. INSTRUMENTATION ENGINEERING

56. The degree of consistency and agreement among independent measurements of the same quantity is called
1. Precision
 2. Accuracy
 3. Drift
 4. Resolution
57. Statistical analysis is used to handle
1. Systematic errors
 2. Random errors
 3. Human errors
 4. Gross errors
58. The area under the error curve from $\bar{x} - \sigma$ to $\bar{x} + \sigma$ will be _____ % of the total area of the curve.
1. 50%
 2. 95%
 3. 68%
 4. 99.7%
59. If the sensitivity of an instrument varies with the input value, the static relation between input and output will be
1. Linear
 2. Non-linear
 3. Time varying
 4. Time invariant
60. Following are the excerpts from the specification of a laser displacement sensor
Measurement range : ± 10 mm
Linear output : 4-20 mA
Find out the sensitivity of the sensor in mA/mm.
1. 2 mA/mm
 2. 1.6 mA/mm
 3. 1 mA/mm
 4. 0.8 mA/mm
61. A $3\frac{1}{2}$ digit voltmeter, operating in 0-2 V range, can have a maximum reading of 1.999 V, find the resolution
1. 0.01 V
 2. 0.0001 V
 3. 0.001 V
 4. 0.1 V
62. Two voltmeters have the same range 0-400 V. The internal impedance are $30\text{ k}\Omega$ and $20\text{ k}\Omega$. If they are connected in series and 600 V be applied across them, the readings are
1. 360 V and 240 V
 2. 300 V each
 3. 400 V and 200 V
 4. One of the meters out of range and other 100 V
63. In a moving iron meter the deflecting torque is proportional to
1. square of the current through the coil
 2. inductance
 3. current through the coil
 4. voltage of the coil

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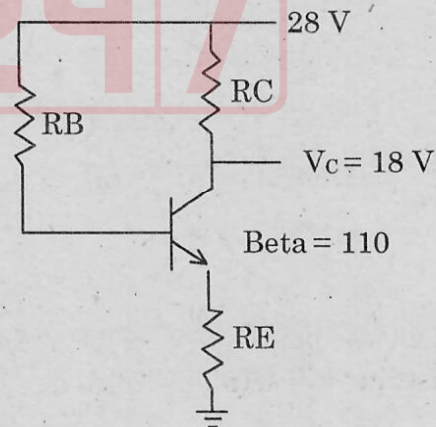
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64. The operating magnetic field in an electro-dynamometer type of instrument has a flux density typically about
1. 1 Wb/m^2
 2. 0.5 Wb/m^2
 3. 0.05 Wb/m^2
 4. 0.005 Wb/m^2
65. A manganin swamping resistance is connected in series with a moving coil ammeter consisting of a milli ammeter and a suitable shunt in order to
1. minimize the effect of temperature variation
 2. obtain large deflecting torque
 3. reduce the size of the meter
 4. minimize the effect of stray magnetic fields
66. Which meter has the highest accuracy in the prescribed limit of frequency range?
1. PMMC
 2. Moving Iron
 3. Electro-dynamometer
 4. Rectifier type instruments
67. From the point of view of safety, the resistance of earthing electrode should be
1. high
 2. the value of resistance of earth electrodes does not affect the safety
 3. medium
 4. low
68. Most commonly used wattmeter is
1. induction type
 2. electrostatic type
 3. dynamometer type
 4. moving iron type
69. Moving coil instruments are
1. permanent magnet type
 2. dynamometer type
 3. induction type
 4. permanent magnet and dynamometer type
70. If the bandwidth of an oscilloscope is from 0-20 MHz; what is the fastest rise time a sine wave can have to be accurately reproduced by the instrument?
1. 35 ns
 2. $35 \mu\text{s}$
 3. 17.5 ns
 4. $0.175 \mu\text{s}$
71. The time base signal in a CRO is a
1. rectangular waveform
 2. high frequency sinusoidal waveform
 3. high frequency sawtooth waveform
 4. square waveform
72. A half wave rectifier circuit using ideal diode has an input voltage $20 \sin \omega t$ volts. Then the average and rms values of output voltage are
1. $\frac{10}{\pi}$ and 10 V
 2. $\frac{10}{\pi}$ and 5 V
 3. $\frac{20}{\pi}$ and 10 V
 4. $\frac{20}{\pi}$ and 5 V

73. The open loop gain of an amplifier is 150. If negative feedback with $\beta = 0.1$ is used, then the closed loop gain will be
1. 15
 2. 9.375
 3. 1500
 4. 10
74. An ideal op-amp requires infinite bandwidth because
1. Signals can be amplified without attenuation
 2. Output common-mode noise voltage is zero
 3. Output voltage occurs simultaneously with input voltage changes
 4. Output can drive infinite number of device
75. Name the semiconductor device that has highest input impedance
1. JFET
 2. MOSFET
 3. BJT
 4. TRIAC
76. Which among the following does not belong to the category of LC oscillators?
1. Hartley oscillator
 2. Colpitt's oscillator
 3. Clapp oscillator
 4. Wein bridge oscillator
77. A n-channel D-MOSFET can operate in
1. depletion mode only
 2. depletion mode and enhancement mode
 3. enhancement mode only
 4. low impedance
78. A half wave rectifier uses load resistor $R_L = 8 \text{ k}\Omega$ and shunt filter capacitor of $12 \mu\text{F}$. The sinusoidal input voltage is $20 \sin 100 \pi t$. The ripple factor is
1. 0.02
 2. 0.04
 3. 0.06
 4. 0.08
79. The emitter-bias configuration of the Fig. below has the following specifications : $I_{CQ} = 4 \text{ mA}$, $V_C = 18 \text{ V}$ and $\beta = 110$. The collector resistance R_C is
- 
1. $1.5 \text{ K}\Omega$
 2. $2.5 \text{ K}\Omega$
 3. $3.5 \text{ K}\Omega$
 4. $4.5 \text{ K}\Omega$

80. An op-amp has a rise time of $0.7 \mu\text{s}$. The Unity gain bandwidth is
1. 5 KHz
 2. 50 KHz
 3. 500 KHz
 4. 5000 KHz
81. The h-parameter equivalent circuit of a BJT is suitable for
1. High frequency, large signal operation
 2. High frequency, small signal operation
 3. Low frequency, small signal operation
 4. Low frequency, large signal operation
82. Which device is used for diagnostic purposes and for recording?
1. Low pass filter
 2. RC oscillator
 3. Voltage Controlled Oscillator
 4. Astable Multivibrator
83. Frequency of oscillation of Wein's bridge oscillator for $R = 3.1 \text{ K}\Omega$ and $C = 0.05 \mu\text{F}$ is
1. 1.026 KHz
 2. 3.026 KHz
 3. 2.026 KHz
 4. 4.026 KHz
84. The output of a logic gate is '1' when all their inputs are at logic 0. The gate is either
1. NAND or an EX OR gate
 2. NOR or an EX-NOR gate
 3. an OR or an EX NOR gate
 4. an AND or an EX-OR gate
85. The number of 16:1 multiplexers required for designing a 4 output 4 variable combinational circuit is
1. 16
 2. 8
 3. 4
 4. 1
86. The complement of the function $F = X(Y'Z' + YZ)$ is
1. $X'Y + Z$
 2. $XY' + XZ' + YZ$
 3. $XY'Z' + YZ$
 4. $X' + YZ' + Y'Z$
87. A data selector is also called a
1. De-multiplexer
 2. Priority encoder
 3. Multiplexer
 4. Decoder
88. In a shift left register, shifting a bit by one bit means
1. division by 2
 2. multiplication by 2
 3. subtraction of 2
 4. none of the above

89. A monotonic DAC is one whose analog output increases for
1. Decreases in digital input
 2. An increases in analog input
 3. An increases in digital input
 4. Decreases in analog input
90. 2's complement of the binary number 1010
1. 0101
 2. 1110
 3. 0110
 4. 1101
91. How many different binary numbers can be stored in a register consisting of six switches?
1. 16
 2. 32
 3. 64
 4. 128
92. The memory address of the last location of a 1 K byte memory chip is given as 0ABFFH what will be the address of the first location?
1. 0A817H
 2. 0A818H
 3. 0A800H
 4. 0A801H
93. IC 8254 and IC 8279 are used for?
1. Peripheral Interfacing and Timer IC respectively
 2. Peripheral Interfacing and Keyboard and Display Interface IC respectively
 3. Timer and Keyboard and Display Interface IC respectively
 4. Timer and Programmable Interrupt Controller IC respectively
94. What does microprocessor speed depends on?
1. Clock
 2. Data bus width
 3. Address bus width
 4. Control bus
95. Which of the following instruction perform as of indirect RAM to accumulator?
1. MOV A, Rn
 2. MOV @ Ri, A
 3. MOV A, @Ri
 4. MOV Rn, A
96. The output signal or reading of a magnetic flowmeter is
1. Inversely Proportional to volumetric flow rate
 2. Proportional to the square of volumetric flow rate
 3. Proportional to the square root of volumetric flow rate
 4. Proportional to volumetric flow rate

97. In McLeod gauge,
1. High pressure fluid is expanded to a low pressure which is read by the manometer technique
 2. Low pressure fluid is compressed to a high pressure which is read by the bourdon technique
 3. High pressure fluid is expanded to a low pressure which is read by the bourdon technique
 4. Low pressure fluid is compressed to a high pressure which is read by the manometer technique
98. Which one of the following is also called square root meter?
1. Pitot tube
 2. Laser Doppler flow meter
 3. Rotameter
 4. Electromagnetic flow meter
99. In gas chromatography, the basis of separation for the components of the volatile material is the difference in
1. partition coefficient
 2. conductivity
 3. molecular weight
 4. molarity
100. The excitation frequency of LVDT is 2 kHz. The maximum frequency of displacement should be limited to
1. 1.5 kHz
 2. 200 Hz
 3. 1 kHz
 4. 0 kHz
101. Which of the following temperature sensor has significant self heating error
1. Thermocouple
 2. RTD
 3. IR thermometer
 4. Thermistor
102. In a particular sample, the absorbance is 0.6. For a molar concentration of the solute $1 \times 10^{-4} \text{ M}$ and 2 cm path length, the molar absorptivity (litre/mole/cm) is
1. 1.2
 2. 1200
 3. 3000
 4. 3×10^{-4}
103. In rotary variable differential transformer, the mutual inductance between the primary and secondary coils varies
1. Linearly with the angular displacement
 2. Non-linearly with the angular displacement
 3. Linearly with the linear displacement
 4. Non-linearly with the linear displacement
104. To increase the sensitivity of LVDT
1. Number of primary and secondary turn to be decreased
 2. The excitation frequency should be decreased
 3. Distance between primary and secondary coil should be increased
 4. The excitation frequency and the number of turns in the primary and secondary coils should be increased

105. Bellows expansion is done usually against a spring. The spring is provided to
1. increase sensitivity
 2. increase operating range
 3. increase linearity
 4. decrease hysteresis effect
106. Which of the following represents relation for kinematic viscosity?
1. Absolute density / mass density
 2. Absolute density $\times$ mass density
 3. Absolute density $\times$ (mass density) 2
 4. Absolute density / (mass density) 2
107. A d/p cell used to measure liquid level has a "suppressed zero". This means
1. The transmitter uses filter circuits to suppress noise to a zero level
 2. The liquid is less dense than water
 3. The transmitter is located below the 0% liquid level mark
 4. The elevation of the vessel is below sea level
108. Unilateral Laplace transform is applied to a signal $x(t)$ if
1. $x(t)$ is periodic
 2. $x(t)$ is causal
 3. $x(t)$ is non-negative
 4. both (1) and (3) are correct
109. In FIR filter design using windows, trade-off exists between
1. Maximum width of main lobe and minimum peak amplitude of sidelobe
 2. Maximum width of main lobe and maximum peak amplitude of sidelobe
 3. Minimum width of main lobe and minimum peak amplitude of sidelobe
 4. Minimum width of main lobe and maximum peak amplitude of sidelobe
110. The layers in ISO OSI protocol stack are
1. Four
 2. Five
 3. Six
 4. Seven
111. Ratio control is where
1. one variable is controlled in proportion to another
 2. a wild flow variable sets the gain of the controller
 3. fuel must be precisely rationed for economy
 4. the rate of one variable must remain fixed over time
112. In closed loop control system, with positive feedback gain the overall gain of the system will
1. decrease
 2. increase
 3. be unaffected
 4. be zero

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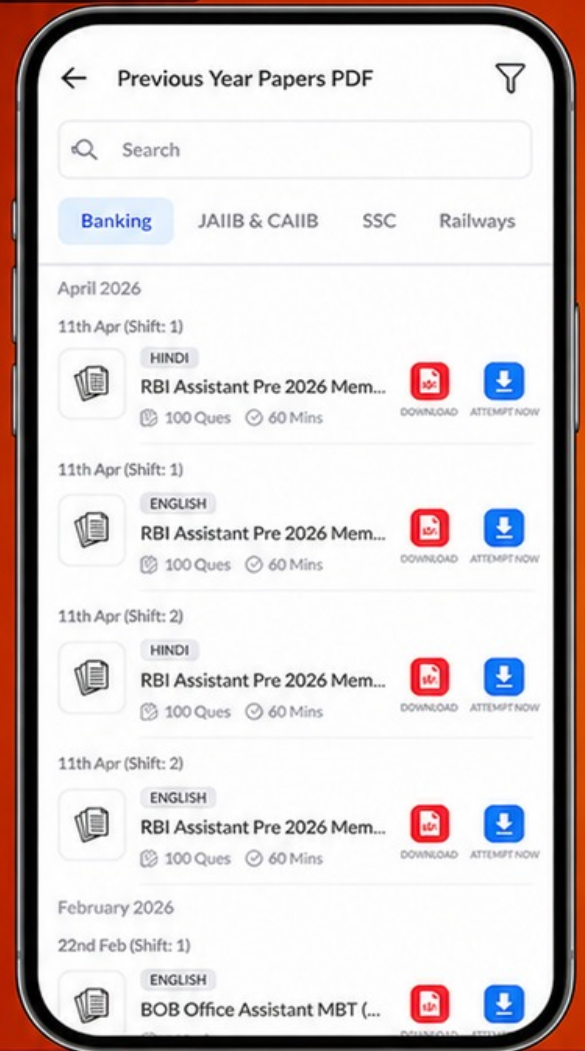
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113. Phase margin of a system is used to specify which of the following

1. frequency response
2. relative stability
3. absolute stability
4. time response

114. In P-I controller, what does an integral function compute?

1. density of curve
2. area under the curve
3. volume over the curve
4. circumference of curve

115. Given the matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$,

the eigen values are

1. 1, 2, 3
2. 1
3. -1, -2, -3
4. 0

116. A system is described by the following state space model

$$\dot{X} = \begin{bmatrix} -1 & 0 \\ 1 & -2 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} r(t) \text{ and}$$

$$Y = [1 \quad 1] X.$$

The transfer function of the system is

1. $G(S) = \frac{(S+1)}{(S+2)(S+3)}$
2. $G(S) = \frac{(S+2)}{(S+1)(S+3)}$
3. $G(S) = \frac{(S+3)}{(S+1)(S+2)}$
4. $G(S) = \frac{(S+1)}{(S-1)(S-2)}$

117. The gain margin in dB for a system with open loop transfer function

$$G(S) = \frac{2\sqrt{2}}{S(S+2)^2} \text{ is}$$

1. 0
2. 6
3. 9
4. 12

118. A unity feedback control system has open loop transfer function $G(S) = \frac{16}{S(S+4)}$.

The resonant frequency in rad/sec is

1. 1.828
2. 2.828
3. 3.828
4. 4.828

119. The forward path gain of a unity feedback control system is

$$G(S) = \frac{144}{S(S+12)}.$$

Peak time of the system is

1. 0.202 second
2. 0.302 second
3. 0.402 second
4. 0.502 second

120. The transfer function of a first order system is $G(S) = \frac{8}{S+4}$. The final steady state value of unit step response is

1. 0.5
2. 2
3. 4
4. 8