

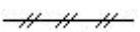



Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. Internal resistance of ideal voltage source is
 (A) Zero (B) finite
 (C) 100 ohms (D) Infinite
2. Standard test signals in control system are
 (A) Impulse (B) Step
 (C) Ramp (D) All of above
3. For stable system location of poles in s plane is _____
 (A) On left half (B) On right half
 (C) On center (D) None of above
4. If an impulse response of a system is e^{-5t} , what would be its transfer function?
 (A) $1/s - 5$ (B) $1/s + 5$
 (C) $s - 5$ (D) None of above
5. The 8051 has _____ 16-bit counter/timers
 (A) 1 (B) 2
 (C) 3 (D) 4
6. Pick out the one which is a first order instrument.
 (A) Bare Thermometer (B) Bare metallic thermometer.
 (C) Bare vapor pressure thermometer. (D) All (a), (b) and (c).
7. The symbol for "capillary line" in instrumentation diagram is
 (A)  (B) 
 (C)  (D) 
8. For given second order transfer function $T(s) = 4/[S^2 + 2S + 4]$ has a damping factor
 (A) 2.0 (B) 0.5
 (C) 1.0 (D) 4.0
9. Which of the following controllers has the least maximum deviation?
 (A) P-controller (B) I-controller
 (C) PI-controller (D) PD-controller
10. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is
 (A) Stable (B) unstable
 (C) Limitedly stable (D) Either (a) or (c)
11. Which control action is also called rate control?

- (A) *P*-controller (B) *D*-controller
(C) *PI*-controller (D) *I*-controller
12. An op-amp has very _____.
(A) high voltage gain (B) high input impedance
(C) low output impedance (D) all of the above
13. If an error signal $e(t)$ of an ON-OFF controller is found to be greater than zero, what would be its output?
(A) 10% (B) 50%
(C) 80% (D) 100%
14. If the system is specified by open loop transfer function $G(s)H(s) = k / s(s+3)(s+2)$, how many root loci proceed to end at infinity?
(A) 2 (B) 3
(C) 5 (D) 6
15. In P-D controller, the derivative action plays a significant role in increasing _____ of response.
(A) Time (B) Distance
(C) Speed (D) Volume
(C) Marginally stable (D) Unpredictable
16. Which of the following is true for bimetallic type thermometer?
(A) Two metals have same temperature coefficients (B) Two metals have different temperature coefficients
(C) One metal is cooled always (D) Both(a) and (b)
17. Kelvin is unit of
(A) Pressure (B) Temperature
(C) Level (D) Flow
18. Accuracy of a measuring instrument indicates the
(A) Closeness of the output reading to the true value (B) Ratio of output value to the input value
(C) Change in output with each change in input (D) Degree of freedom from random errors
19. Gain of an instrument is defined as
(A) Closeness of the output reading to the true value (B) Ratio of output value to the input value
(C) Change in output with error (D) Degree of freedom from random errors
20. For a system to work, as oscillator the feedback of system is
(A) Less than 1 (B) Greater than 1
(C) Equal to 1 (D) zero
21. Smallest change which a sensor can detect is
(A) Accuracy (B) Precision
(C) Resolution (D) Scale
22. Chromatography is a physical method that is used to separate and analyse _____.
(A) Simple mixtures (B) Complex mixtures
(C) Viscous mixtures (D) Metals
23. The detectors used in optical sensors is
(A) Photo Diode (B) Diode
(C) Transistor (D) Both(a) and (b)

24. Resistor is a _____ element.
 (A) Zero order (B) First order
 (C) Third order (D) None of above
25. What is the time constant for a resistor-capacitor network?
 (A) R (B) R/C
 (C) RC (D) C/R
26. Which of the following has transfer function $G(S) = 1/(1+S\tau)$?
 (A) Zero order (B) First order
 (C) Second order (D) None of above
27. In LC circuit resonant frequency is defined by
 (A) \sqrt{L} (B) LC
 (C) \sqrt{LC} (D) $1/(\sqrt{LC})$
28. Which of following represent active transducer?
 (A) Strain gauge (B) Thermistor
 (C) LVDT (D) Thermocouple
29. What is the span of an instrument, operating under a bias which read value from 230V to 450V only?
 (A) 450 (B) 200
 (C) 220 (D) 230
30. What is 'live zero'?
 (A) Output zero for zero input (B) Output non zero for zero input
 (C) Output null for all input (D) Output unpredictable
31. Filters are used to convert
 (A) Pulsating dc signal into a pure dc signal (B) Pulsating ac signal into a pure dc signal
 (C) Pulsating dc signal into a pure ac signal (D) Pulsating ac signal into a pure ac signal
32. The output of an OR gate with three inputs, A, B, and C, is LOW when
 (A) A = 0, B = 0, C = 0 (B) A = 0, B = 0, C = 1
 (C) A = 1, B = 1, C = 1 (D) A = 0, B = 1, C = 1
33. Which of the following gates has the exact inverse output of the OR gate for all possible input combinations?
 (A) NOR (B) NOT
 (C) NAND (D) Both(a) and (b)
34. Pyrometer is used to measure
 (A) Pressure (B) Level
 (C) Temperature (D) Density
35. The sensitivity of a resistive transducer can be increased by
 (A) increasing the length of wire (B) Decrease the length of wire
 (C) increasing the current of wire (D) Decrease the current of wire
36. Flow rate Q is proportional to
 (A) Pressure (B) Square of pressure
 (C) Root of pressure (D) Square root of differential pressure
37. Damping Ratio value for unstable control system is
 (A) 1 (B) 0

- (C) 10 (D) -1
38. Turbine meters are generally preferred for
 (A) Low viscosity and high flow measurement (B) High viscosity and high flow measurement
 (C) High viscosity and high flow measurement (D) Low viscosity and low flow measurement
39. Example for positive displacement meter is
 (A) Variable area flow meter (B) Turbine meters
 (C) Rotary Piston meter (D) Venturi
40. The devices used for differential pressure measurement is
 (A) Orifice plate (B) Manometer
 (C) Rota meter (D) None of above
41. For the measurement of flow rate of liquid, the method used is
 (A) Orifice plate (B) Manometer
 (C) Bourdon tube (D) Rota meter method
42. Which language is more popular for PLC programming?
 (A) Graphical (B) Text base
 (C) Ladder Logic (D) Assembly
43. _____ method is used for contact less temperature measurement system
 (A) Thermocouple (B) RTD
 (C) Thermister (D) Pyrometer
44. For pneumatic type of system value for supply pressure is
 (A) 14.7 PSI (B) 3 PSI
 (C) 15 PSI (D) 3-15PSI
45. FIR filter is
 (A) open loop filter (B) close loop filter
 (C) both (a) and (b) (D) none of above
46. Which of the following is not the triple point of water?
 (A) 32°R (B) 273°K
 (C) 492°R (D) 32°F
47. Configuration of Bourdon spring tube is never made of _____ shape.
 (A) circular (B) semi-circular
 (C) helical (D) spiral
48. Which of the following instruments is not used for measuring sub-zero temperatures?
 (A) Platinum resistance thermometer (B) Mercury in glass thermometer
 (C) Vapor pressure thermometer (D) Radiation pyrometer
49. Split range control scheme uses
 (A) two controller and one valve (B) two controllers and two valve
 (C) one controller and one valve (D) one controller and two valves
50. Which is the strongest paramagnetic gas?
 (A) CO₂ (B) O₂
 (C) NO (D) NO₂
51. Use of hygrometer is to measure
 (A) Temperature (B) Humidity
 (C) Hygienic condition (D) High speed

52. The loop transfer function of a feedback control system is given by $G(s)H(s)=1/s(s+1)(9s+1)$ its phase cross over frequency (rad/s) is
 (A) 1.22 (B) 0.7
 (C) 0.33 (D) 0.1
53. Mercury manometer (U-tube type) exemplifies a _____ order system.
 (A) zero (B) First
 (C) second (D) Third
54. Bode stability method uses _____ loop transfer function.
 (A) open (B) Closed
 (C) either (a) or (b) (D) neither (a) nor (b)
55. Working principle of bimetallic thermometers is difference in linear co-efficient of thermal expansion of two strips of different metals welded together. Which of the following has the maximum thermal co-efficient of linear expansion?
 (A) Nickel (B) Chromel
 (C) Brass (D) none of above
56. Thermal conductivity cell is the primary element of a/an _____ analyzer.
 (A) oxygen (B) sulphur dioxide
 (C) carbon monoxide (D) Carbon dioxide
57. Which digital logic can be used as equality detector?
 (A) X-OR (B) X-NOR
 (C) AND (D) none of above
58. How many NAND gates are requiring to make HALF ADDER?
 (A) 5 (B) 4
 (C) 3 (D) none of above
59. which type of element is normally not used in the bimetallic thermometers
 (A) Flat spiral (B) Bourdon tube
 (C) Single helix (D) Multiple helix
60. Convert binary 01001110 to decimal.
 (A) 4E (B) 79
 (C) 76 (D) none of above
61. An LED made up of
 (A) Phosphorescent material (B) Germanium
 (C) Silicon (D) Gallium Arsenide
62. Three input NOR gate gives logic high output only when
 (A) One input is high (B) One input is low
 (C) All input low (D) All input high
63. For measuring the temperature of a red hot furnace, which is the most suitable instrument ?
 (A) Platinum resistance thermometer (B) Thermocouple
 (C) Optical pyrometer (D) Bimetallic thermometer
64. which temperature has highest sensitivity
 (A) Thermister (B) RTD
 (C) Thermocouple (D) none of above
65. Binary of 64 is
 (A) 1010000 (B) 1000000
 (C) 1010000 (D) 1111100

66. A digital voltmeter can count from 0 to 9999. If full scale reading is 9.999 V, the resolution of full scale reading is
 (A) 0.001 (B) 0.01
 (C) 0.00001 (D) 1
67. Radiation pyrometer is used to measure temperature in the range of
 (A) -200 to 500° C (B) 500 to 1200° C
 (C) 1200 to 2500° C (D) 0 to 500° C
68. Whether a linear system is stable or unstable that it
 (A) is a property of the system only (B) depends on the input function only
 (C) either (a) or (b) (D) both (a) and (b)
69. A stepper motor is
 (A) a two phase induction motor (B) is a kind of rotating amplifier
 (C) is an electromagnetic transducer (D) is an electromechanical device which
 used to convert an angular position of shaft into electrical signal
 actuates a train of step angular movements in response to a train of input pulses on one to one basis
70. From the noise point of view, bandwidth should
 (A) be large (B) not be too large
 (C) should be as large as possible (D) should be infinite
71. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is
 (A) stable (B) unstable
 (C) limitedly stable (D) either (a) or (c)
72. A lag compensator is essentially a
 (A) low pass filter (B) high pass filter
 (C) band pass filter (D) either (a) or (b)
73. Stepper motors find applications in
 (A) X-Y plotters (B) numerically controlled machining equipment
 (C) printers (D) all of the above
74. For type 2 system, the magnitude and phase angle of the term $(j\omega)^2$ in the denominator, at $\omega = 0$, are respective
 (A) 0 and - 90° (B) 0 and + 90°
 (C) infinity and - 180° (D) infinity and + 180°
75. In an integral controller
 (A) the output is proportional to input (B) the rate of change of output is proportional to input
 (C) the output is proportional to rate of change of input (D) none of the above
76. Bode magnitude plot is drawn between
 (A) magnitude of network function and ω (B) dB magnitude and $\log \omega$
 (C) dB magnitude and ω (D) \log_e (magnitude) and $\log \omega$

77. PID controlled system has
 (A) P and I actions in forward path and D action in feedback path
 (B) P and I actions in feedback path and actions in forward path
 (C) All the three (i.e., P, I and D) actions in forward path
 (D) All the three (i.e., P, I and D) actions in feedback path
78. Bellows converts
 (A) pressure difference into displacement
 (B) pressure difference into voltage
 (C) displacement into pressure difference
 (D) None of above
79. For the transport lag $G(j\omega) = e^{-j\omega T}$, the magnitude is always equal to
 (A) 0
 (B) 1
 (C) 10
 (D) 0.5
80. The log magnitude curve for a constant gain K is a
 (A) horizontal straight line
 (B) horizontal straight line of magnitude 20 log K decibels
 (C) an inclined line having slope K
 (D) an inclined line having slope -K
81. For a square matrix A
 A $A = A^T$
 B $\det(A) = \det(A^T)$
 C $A = A^{-1}$
 D $\det(A) = \det(A^{-1})$
82. To solve a system $A\bar{X} = B$ of linear equations using Gauss-Jordan method, the augmented matrix $[A : B]$ is transformed to
 A row echelon form matrix
 B upper triangular matrix
 C reduced row echelon form matrix
 D identity matrix
83. For $f(x) = (x - 2)^{2/3}$, which of the following statements is incorrect?
 A f is continuous for all x
 B f is continuous for all x , except at 2
 C f is differentiable for all x
 D f is differentiable for all x , except at 2
84. Which of the following functions satisfies the hypothesis of the mean value theorem for differentiation?
 A $f(x) = x^{2/3}; [-1, 8]$
 B $f(x) = \sin x/x; [-\pi, 0)$ and $f(0) = 0$
 C $f(x) = x^{4/5}; [0, 1]$
 D $f(x) = (x - 1)^{1/2}; [0, 2]$
85. Which of the following is a single step method to solve differential equations numerically?
 A Adam-Bashforth method
 B Modified Euler's method
 C Taylor series method
 D Fourth-order Runge-Kutta method

86. $f(x) = x^3 + 2x - 5$ has a root in the interval $[0, 2]$. According to the bisection method, which interval will be the next?
- A $[0, 1]$ B $[1, 2]$
 C $[1/2, 2]$ D $[0, 3/2]$
87. $\int_1^2 \frac{(\ln x)^2}{x} dx = \underline{\hspace{2cm}}$
- A $\frac{8}{3} \ln 2$ B $\frac{1}{3} (\ln 2)^3$
 C $\frac{4}{3} \ln 2$ D $12 (\ln 2)^3$
88. For the function $z = f(x, y)$ to have a minimum value at a critical point, the conditions are
- A $r > 0$ and $rt - s^2 > 0$ B $r > 0$ and $rt - s^2 < 0$
 C $r < 0$ and $rt - s^2 < 0$ D $r < 0$ and $rt - s^2 > 0$
89. Which of the differential equation given below is not linear?
- A $y' + e^x y = 0$ B $y' + x e^y = y$
 C $e^x y' = x - 2y$ D $y' - y = \tan x$
90. For a level surface $\phi(x, y, z) = c$, where c is a constant, its normal is represented by
- A $\text{curl } \phi$ B $\text{div } \phi$
 C $\text{grad } \phi$ D none
91. The Laplace transform of the function $f(t) = t^2$ is
- A $\frac{1}{s}$ B $\frac{2}{s^3}$
 C $\frac{1}{s^2}$ D $\frac{6}{s^2}$
92. For an analytic function $f(z) = u(x, y) + i v(x, y)$, one can find $f'(z)$ using
- A $f'(z) = \frac{\partial u}{\partial x} + i \frac{\partial u}{\partial y}$ B $f'(z) = \frac{\partial u}{\partial x} - i \frac{\partial u}{\partial y}$
 C $f'(z) = \frac{\partial v}{\partial x} + i \frac{\partial v}{\partial y}$ D $f'(z) = \frac{\partial v}{\partial x} - i \frac{\partial v}{\partial y}$
93. If $I = \int_C z^2 dz$, where C is the upper half of the circle $|z| = 2$ in counterclockwise direction, then
- A $I = 8 \int_0^\pi (-\sin 3t + i \cos 3t) dt$ $I = 8 \int_0^\pi (\sin 3t + i \cos 3t) dt$
 C $I = 8 \int_0^\pi (-\sin 3t - i \cos 3t) dt$ $I = 8 \int_0^\pi (\sin 3t - i \cos 3t) dt$
94. What is the order of zero of $f(z) = \frac{(z^2-1)(z-1)}{z^6+1}$ at $z = \infty$?
- A 1 B 2
 C 3 D 0
95. In an experiment of tossing a coin three times the probability of getting exactly two HEAD is.....
- A $1/8$ B $1/4$
 C $3/8$ D $1/2$
96. $P(A \cap B) = \underline{\hspace{2cm}}$
- A $P(B)P(A/B)$ B $P(A)P(A/B)$

97. $\lim_{x \rightarrow 0^+} x^x = \frac{P(B)P(B/A)}{\quad}$
- A 1
C ∞
- D $P(A \cup B) - P(A) - P(B)$
B 0
D e
98. The differential equation $\frac{d^2 y}{dt^2} + \frac{1}{t} \frac{dy}{dt} + \frac{y}{t^2} = e^t$ is
- A a nonlinear differential equation
C Cauchy's homogeneous equation
- B Bessel's equation
D Jacobi equation
99. For the shift operator E , what is $E^2(x)$, with step size 1?
- A 0
C x^4
- B 1
D $x + 2$
100. The mean of the probability distribution of the number of head obtained in two flips of a balanced coin is
- A $3/4$
C $1/4$
- B 1
D $1/2$