

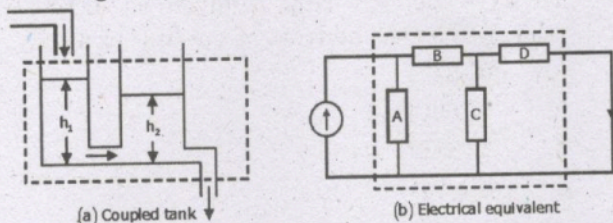
# 15 — INSTRUMENTATION, ELECTRONICS AND CONTROL ENGINEERING

(Answer ALL questions)

56. If there are 'b' branches and 'n' nodes the number of equations will be

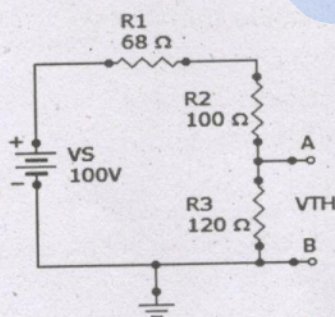
1.  $n-1$
2.  $b$
3.  $b-n-1$
4.  $b-n+1$

57. If the electrical circuit of figure (b) is an equivalent of the coupled tank system of figure (a), then



1. A, B are resistances and C, D capacitances
2. A, C are capacitances and B, D resistances
3. A, B are capacitances and C, D resistances
4. A, C are resistances and B, D capacitances

58. Find the Thevenin's equivalent ( $V_{TH}$  and  $R_{TH}$ ) between terminals A and B of the circuit given below.

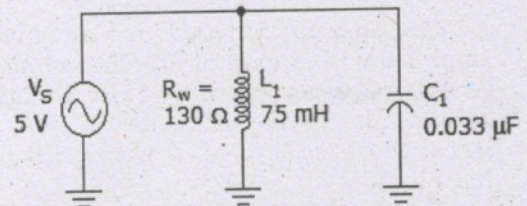


1. 41.6 V, 120  $\Omega$
2. 4.16 V, 120  $\Omega$
3. 41.6 V, 70  $\Omega$
4. 4.16 V, 70  $\Omega$

59. The form factor of an alternating current waveform is the ratio of the

1. r.m.s value to peak value
2. peak value to r.m.s value
3. r.m.s value to average value
4. average value to r.m.s value

60. What is the resonant frequency in the given circuit?



1. 3.2 kHz
2. 275.8 Hz
3. 11.6 Hz
4. 1.5 kHz

61. The fundamental period of the signal

$$x(n) = \frac{\cos \pi}{3} n + \frac{\cos 3\pi}{4} n$$

1. 3
2. 6
3. 12
4. 24

62. ROC of a finite causal discrete time sequence is

1. Entire  $z$ -plane
2. Entire  $z$ -plane except  $z = 0$
3. Entire  $z$ -plane except  $z = \infty$
4. Entire  $z$ -plane except  $z = 0$  and  $z = \infty$

63. DFT is

1. Sampled version of  $z$  transform
2. Discrete time Fourier transform
3.  $Z$ -transform on unit circle
4. Sampled version of discrete time Fourier transform

64. Poles of the system described by the difference equation

$$y(n) + 3y(n-1) + 2y(n-2) = x(n) + x(n-1) \text{ are.}$$

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

65. In an FIR filter, present output depends on

1. Present input
2. Present input and past inputs
3. Present input, past inputs and past outputs
4. Present and future inputs



66. RC phase shift oscillator is designed to oscillate at 100 Hz. If  $C = 0.1 \mu\text{F}$
1.  $R = 0.649 \text{ K}\Omega$
  2.  $R = 6.49 \text{ K}\Omega$
  3.  $R = 64.9 \text{ K}\Omega$
  4.  $R = 649 \text{ K}\Omega$
67. A 741 op-amp is used as an inverting amplifier with a gain of 50. The voltage gain versus frequency curve of 741C is flat upto 20kHz. The maximum peak to peak input signal that can be applied without distorting the output is
1. 139 mV
  2. 149 mV
  3. 159 mV
  4. 169 mV
68. BJT can be used as an amplifier in
1. Cut-off region
  2. Active region
  3. Saturation region
  4. Both cut-off and saturation region
69. BJT has \_\_\_\_\_ input impedance and MOSFET has \_\_\_\_\_ input impedance.
1. Low and low
  2. Low and high
  3. High and low
  4. High and high
70. Precision rectifier is used to reduce the cut-in voltage of diode from 0.6 to
1. 6 mV
  2. 60 mV
  3. 6  $\mu\text{V}$
  4. 60  $\mu\text{V}$
71. How many Flip-Flops are required for mod-16 counter?
1. 5
  2. 6
  3. 4
  4. 3
72. The digital logic family which has minimum power dissipation is
1. TTL
  2. RTL
  3. DTL
  4. CMOS
73. The A/D converter whose conversion time is independent of the number of bits is
1. Parallel conversion
  2. Dual slope
  3. Counter type
  4. Successive approximation
74. MOV 45, #5FH  
MOV R0, 45H  
INC R0  
MOV @R0, #40H  
The location value of R0 and the content at that place are
1. 45H, 5FH
  2. 60H, 40H
  3. 40H, 60H
  4. 60H, 45H
75. The memory address of the last location of a 1K byte memory chip is given as 0FBFFH what will be the address of the first location?
1. 0F817H
  2. 0F800H
  3. 0F818H
  4. 0F801H
76. The full scale deflection of a meter is 1 mA and its internal resistance is 100  $\Omega$ . This meter is to have full deflection when 100 V is measured. What is the value of series resistor to be used?
1. 99.90 k $\Omega$
  2. 100 k $\Omega$
  3. 99.99 k $\Omega$
  4. 100  $\Omega$
77. PMMC type instruments normally used for
1. Air friction damping
  2. Fluid friction damping
  3. Eddy current damping
  4. None of the above
78. In the two wattmeter method of measuring power in a balance three-phase circuit, one wattmeter shows zero and the other positive maximum. The load power factor is
1. zero
  2. 0.5
  3. 0.866
  4. 1.0
79. Schering bridge is used to measure
1. Capacitance
  2. Inductance
  3. Low resistance
  4. Mutual inductance



80. A megger is usually
1. Moving iron type instrument
  2. Electrostatic type instrument
  3. Hotwire type instrument
  4. Moving coil type instrument
81. In CRT, aquadag carries
1. Aqueous solution of graphite
  2. Sweep voltage
  3. Secondary emission electrons
  4. None of the above
82. In a dual slope integrating type digital voltmeter, the first integration is carried out for 10 periods of the supply frequency of 50 Hz. If the reference voltage used is 2 V, the total conversion time for an input of 1 V is
1. 0.01 s
  2. 0.05 s
  3. 0.1 s
  4. 1 s
83. The standardization of AC potentiometer is done by
1. Using DC standard source and d'Arsonval galvanometer
  2. Using AC standard sources and transfer instruments
  3. Directly using AC standard voltage sources
  4. Using DC standard sources and transfer instruments
84. Identify the correct set of matches
- |                              |                        |
|------------------------------|------------------------|
| a. Mean free path            | p. Hot wire anemometer |
| b. Piezo electric transducer | q. Optical pyrometer   |
| c. Heat transfer coefficient | r. Knudsen gauge       |
| d. Intensity of radiation    | s. Dynamic pressure    |
1. (a) → (r), (b) → (s), (c) → (p), (d) → (q)
  2. (a) → (r), (b) → (s), (c) → (q), (d) → (p)
  3. (a) → (s), (b) → (r), (c) → (p), (d) → (q)
  4. (a) → (s), (b) → (r), (c) → (q), (d) → (p)
85. 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. 4.0 kHz
86. A resistance potentiometer has a total resistance of 10000  $\Omega$  and is rated 4W. If the range of the potentiometer is 0 to 100mm then its sensitivity in v/mm is
1. 2.0
  2. 1.0
  3. 0.5
  4. 1.5
87. A pirani gauge measuring vacuum pressure works on the principle of
1. Change in ionization potential
  2. Variation of volume with pressure
  3. Variation of viscosity with pressure
  4. Change in thermal conductivity
88. A pipe line is carrying water at a pressure of 10kg/cm<sup>2</sup> is running at the ground level. A pressure gauge is mounted at a height of 2 m to measure the line pressure. What will be the error in the measurement
1. 6%
  2. 4%
  3. 2%
  4. 8%
89. Which type of RTD has a linear characteristics
1. Copper
  2. Platinum
  3. Nickel
  4. Iron
90. The table provides the thermo-emf sensitivity of five materials with reference to platinum around 273K.
- | Material                            | Constantan | Nickel | Copper | Iron | Nichrome |
|-------------------------------------|------------|--------|--------|------|----------|
| Sensitivity ( $\mu\text{VK}^{-1}$ ) | -35        | -25    | 6      | 18.5 | 25       |
- The thermocouple pair that gives the maximum sensitivity around 273K is
1. Nichrome-Constantan
  2. Platinum-Constantan
  3. Copper-Nickel
  4. Copper-Iron
91. Determine the flow velocity of water of density 1000 kg/m<sup>3</sup> at the head of the pitot tube if it produces a pressure difference of 10 KPa between the outlets
1. 7.47 m/s
  2. 5.47 m/s
  3. 6.47 m/s
  4. 4.47 m/s



92. In a rotameter ' $\rho$ ' is the density of the float and ' $\rho_f$ ' is the density of the fluid. If the flow rate should not depend on the fluid density, then
1.  $\rho = 2\rho_f$
  2.  $\rho_f = 2\rho$
  3.  $\rho = (\frac{1}{2})\rho_f$
  4.  $\rho_f = \rho$
93. Which of the flowmeter has the lowest pressure drop for a given range of flow?
1. Orifice
  2. Flow nozzle
  3. Venturimeter
  4. Dall tube
94. In Gas chromatography, the basis for separation of the components of the volatile material is the difference in
1. Partition coefficients
  2. Conductivity
  3. Molecular weight
  4. Molarity
95. Which law governs the principle of ion deflection in mass spectroscopy?
1. Lorentz force law and Beer Lambert Law
  2. Beer Lambert law
  3. Newton's 2<sup>nd</sup> law and Lorentz Force law
  4. Lorentz Force law
96. The conductivity of a liquid depends on
1. Concentration of ions
  2. Temperature of ions
  3. Concentration and temperature
  4. Concentration, ion mobility and temperature
97. It is not possible to use a pH probe in alcoholic solutions for longer time because
1. The response time will increase
  2. The glass membrane will dehydrate
  3. Glass impedance will increase resulting in slow response time.
  4. The stabilization time for the pH probe will increase
98. As temperature increases, pH values of base and acid \_\_\_\_\_ and \_\_\_\_\_ respectively.
1. increases & increases
  2. increases, decreases
  3. decreases, increases
  4. decreases, decreases
99. VSB modulation is preferred in Television transmission because
1. It reduces the bandwidth requirements to half
  2. It preserves the low frequency components
  3. Both (1) and (2) are correct
  4. (1) is correct and (2) is wrong
100. A 400W carrier is amplitude modulated with  $m = 0.75$ . The total power in AM is
1. 400 W
  2. 512 W
  3. 588 W
  4. 650 W
101. Assertion (A) : Free space does not interfere with normal radiation and propagation of radio waves
- Reason (R) : Free space has no magnetic or gravitational fields.
1. Both (A) and (R) are correct and (R) is correct explanation of (A)
  2. Both (A) and (R) are correct but (R) is not correct explanation of (A)
  3. (A) is correct but (R) is wrong
  4. (A) is wrong but (R) is correct
102. Which of the following parameter does an optical fiber sense?
1. Temperature
  2. Pressure
  3. Strain
  4. All of the above
103. Step index optical fibers sustains
1. Single mode of propagation
  2. Multimode of propagation
  3. (1) and (2)
  4. Limited to 10 modes



104. Closed-loop transfer function of a unity-feedback system is given by  $\frac{Y(s)}{R(s)} = \frac{1}{\tau s + 1}$ . Steady-state error to unit-ramp input is
1.  $\infty$
  2.  $\tau$
  3. 1
  4.  $1/\tau$
105. The phase lag produced by transportation delay
1. is independent of frequency
  2. is inversely proportional to frequency
  3. increases linearly with frequency
  4. decreases linearly with frequency
106. Peak overshoot of step-input response of an under damped second-order system is explicitly indicative of
1. Settling time
  2. Rise time
  3. Natural frequency
  4. Damping ratio
107. A negative unity feedback system has open-loop transfer function  $G(s) = 4/s(s+4)$ . The nature of the step response is
1. Under damped
  2. Over damped
  3. Critically damped
  4. Oscillatory
108. The transfer function of a first-order system is  $T(s) = 8/s + 4$ . The final steady state value of the unit step response is
1. 0.5
  2. 2
  3. 4
  4. 8
109. A system with gain margin close to unity or a phase margin close to zero is
1. Highly stable
  2. Oscillatory
  3. Relatively stable
  4. Unstable
110. The equation  $2s^4 + s^3 + 3s^2 + 5s + 10 = 0$  has \_\_\_\_\_ roots in the left half of s-plane.
1. one
  2. two
  3. three
  4. four
111. Electrical time-constant of an armature-controlled dc servomotor is
1. equal to mechanical time-constant
  2. smaller than mechanical time-constant
  3. larger than mechanical time-constant
  4. not related to mechanical time-constant
112. The steady-state error of a feedback control system with an acceleration input becomes finite in a
1. Type 0 system
  2. Type 1 system
  3. Type 2 system
  4. Type 3 system
113. Which of the following terms describe a control strategy in which the output of one controller is used to manipulate the set point of another controller?
1. Ratio
  2. Cascade
  3. Feed-forward
  4. Feed-forward plus feedback
114. In a \_\_\_\_\_ control system, the control function is allocated to several microprocessor-based control units. These control units can manipulate one or more process control loops, perform calculations and detect alarm functions. In this system no computer has all of the control responsibility.
1. DDC
  2. Supervisory
  3. PLC
  4. DCS
115. The following P&ID symbol stands for :
- 
1. Pressure Switch
  2. Pressure Transmitter
  3. Pressure controller
  4. Pressure Indicating Controller