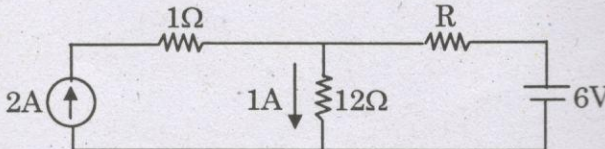


## 11 — BIOMEDICAL ENGINEERING

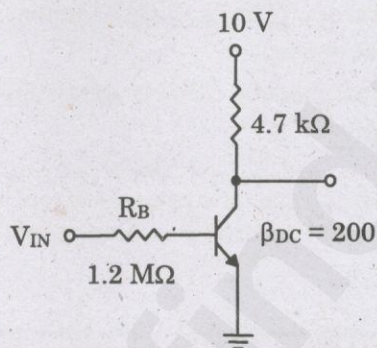
(Answer ALL questions)

56. Sodium pump is an example for
1. Primary active transport
  2. Secondary active transport
  3. Osmosis
  4. None of the above
57. Cause of first heart sound is due to
1. Closure of AV valves
  2. Opening of AV valves
  3. Opening of semilunar valves
  4. Closure of semilunar valves
58. The membrane potential of the cardiac muscle cells is most affected by even a small change in plasma concentration of :
1. Na
  2. K
  3. Cl
  4. Ca
59. For a respiratory minute volume of 6 liters, which of the following combinations of breathing rate and tidal volumes allows for maximum alveolar ventilation in a healthy individual?
1. 10 breaths per minute: and 600 ml
  2. 15 breaths per minute: and 400 ml
  3. 20 breaths per minute: and 300 ml
  4. 30 breaths per minute: and 200 ml
60. Glycolysis is the name given to the pathway involving the conversion of:
1. Glycogen to glucose-6-phosphate
  2. Glycogen or glucose to fructose
  3. Glycogen or glucose to pyruvate or lactate
  4. Glycogen or glucose to pyruvate or acetyl CoA
61. The process of breaking down triacylglycerol into free fatty acids and glycerol is called:
1. Beta oxidation
  2. Lipogenesis
  3. Lipolysis
  4. Both (1) and (3)
62. A disaccharide made up of two glucose units is
1. Sucrose
  2. Maltose
  3. Lactose
  4. Dextrin
63. Which of the following statements about the general principles of fatty acid synthesis is correct?
1. Fatty acids cannot be synthesized from glucose
  2. Fatty acids can be converted to glucose
  3. Excess protein intake cannot lead to fat deposition
  4. Fatty acids can be synthesized from glucose
64. If the  $12\ \Omega$  resistor draws a current of 1 A as shown in the figure, the value of resistance R is
- 
- The circuit diagram shows a 2A current source on the left. A 1Ω resistor is connected in series with the current source. Following this resistor, the circuit splits into a parallel branch containing a 12Ω resistor. After the parallel branch, the circuit continues through a series resistor labeled R, and finally reaches a 6V DC voltage source.
1.  $4\ \Omega$
  2.  $6\ \Omega$
  3.  $8\ \Omega$
  4.  $18\ \Omega$
65.  $V_L = V_C$  in a series RLC circuit when
1. The value of impedance is minimum
  2. The power factor is zero
  3. The current lead the total voltage by  $90^\circ$
  4. The total voltage is zero

66. A source  $V_s(t) = V \cos(100\pi t)$  has an internal impedance of  $(4 + j3)\Omega$ . If a purely resistive load connected to this source has to extract the maximum power out of the source, its value in  $\Omega$  should be
1. 3
  2. 4
  3. 5
  4. 7

67. While calculating  $R_{th}$  in Thevenin's theorem and Norton's equivalent n
1. All independent sources are made dead
  2. Only current sources are made dead
  3. Only voltage sources are made dead
  4. All the voltage and current sources are made dead

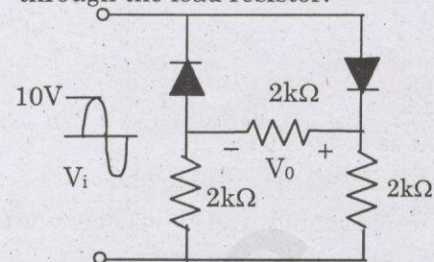
68. Refer to this figure. Determine the minimum value of  $V_{IN}$  from the following that will saturate this transistor.



1. 13.21 V
2. 12.51 V
3. 0.7 V
4. 9.4 V

69. What is the order of doping, from heavily to lightly doped, for each region?
1. Base, collector, emitter
  2. Emitter, collector, base
  3. Emitter, base, collector
  4. Collector, emitter, base

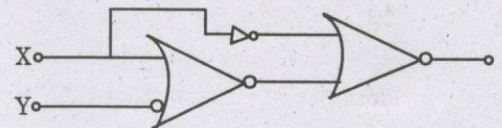
70. Determine the average value of the current through the load resistor.



1. 2.5 mA
2. 0 mA
3. 1.37 mA
4. 1.479 mA

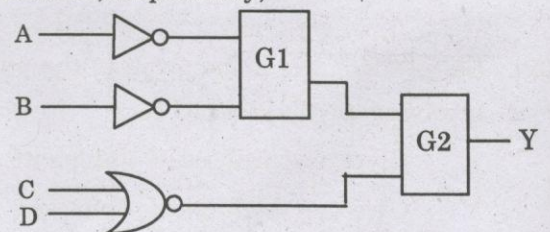
71. An amplifier is stable if the absolute magnitude of  $\beta A$  is
1.  $\infty$
  2. less than 1
  3. Greater than 1
  4. None of the above

72. The logic circuit shown in the given figure can be minimised to



1. X through an inverter
2. X and Y through an AND gate
3. X and Y through an OR gate
4. X through an inverter

73. In the figure shown, the output Y is required to be  $Y = AB + C'D'$ . The gates G1 and G2 must be, respectively,



1. NOR, OR
2. OR, NAND
3. NAND, OR
4. AND, NAND

74. How many two-input AND and OR gates are required to realize  $Y = CD + EF + G$ ?

1. 3,3
2. 2,3
3. 2,2
4. none of the above

75. Which of following are known as universal gates?

1. NAND & NOR
2. AND & OR
3. XOR & OR
4. None of the above

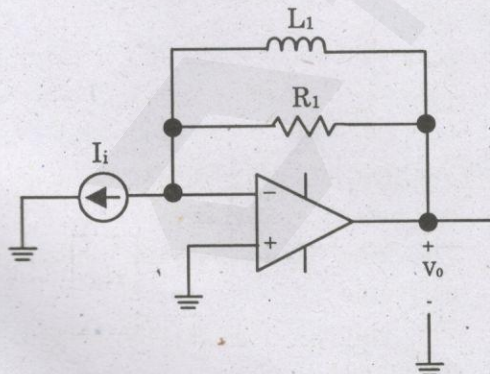
76. If the differential voltage gain and the common mode voltage gain of a differential amplifier are 48 dB and 2 dB respectively, then its common mode rejection ratio is

1. 23 dB
2. 25 dB
3. 46 dB
4. 50 dB

77. The ideal Op - Amp has the following characteristics.

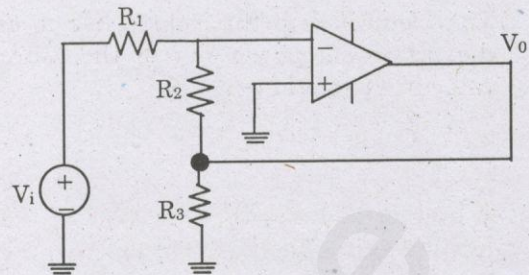
1.  $R_i = \infty, A = \infty, R_o = 0$
2.  $R_i = 0, A = \infty, R_o = 0$
3.  $R_i = \infty, A = \infty, R_o = \infty$
4.  $R_i = 0, A = \infty, R_o = \infty$

78. The circuit below implement a filter between the input current  $i_i$  and output voltage the op-amp is ideal. The filter implemented is a



1. low pass filter
2. band pass filter
3. band stop filter
4. high pass filter

79. Assuming the op-amp to be ideal, the voltage gain of the amplifier shown below is



1.  $-\left(\frac{R_2}{R_1}\right)$
2.  $-\left(\frac{R_3}{R_1}\right)$
3.  $-\left(\frac{R_2 \parallel R_3}{R_1}\right)$
4.  $-\left(\frac{R_2 + R_3}{R_1}\right)$

80. The memory address of the last location of an 8K byte memory chip is FFFFH. Find the starting address.

1. 9000H
2. D000H
3. E000H
4. A000H

81. The \_\_\_\_\_ is a Programmable Interrupt Controller (IC) specifically designed for use with the interrupt signals (INTR /INT) of the 8085 microprocessor.

1. 8255
2. 8237
3. 8251
4. 8259

82. In 8086 the overflow flag is set when

1. The sum is more than 16 bits
2. Signed numbers go out of their range after an arithmetic operation
3. Carry and sign flag are set
4. Zero flag is set

83. Which of the following is not a data copy/transfer instruction?

1. MOV
2. PUSH
3. IN
4. POP

84. Fourier transform of a 2D Gaussian function results in a 2D
1. Gaussian
  2. Sinc
  3. Step
  4. Comb

85. A system is defined by its impulse response  $h(n) = 2^n u(n - 2)$ . The system is
1. Stable and causal
  2. Causal but not stable
  3. Stable but not causal
  4. Unstable and non-causal

86. In a LTI system with input  $x(n)$  and output  $y(n)$ , the output psd is related to the input PSD as

1.  $P_y(e^{j\omega}) = P_x(e^{j\omega}) |H(e^{j\omega})|$
2.  $P_y(e^{j\omega}) = P_x(e^{j\omega}) H^2(e^{j\omega})$
3.  $P_y(e^{j\omega}) = P_x(e^{j\omega}) |H(e^{j\omega})|^2$
4.  $P_y(e^{j\omega}) = P_x(e^{j\omega}) / H(e^{j\omega})$

87. The mean of the output  $y(n)$  in a LTI system with  $h(n) = (0.5)^n u(n)$  and input mean = 0.75 is

1. 0.75
2. 1.5
3. 0.5
4. 1.333

88. A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency to be used is

1. 5 kHz
2. >10kHz
3. <10kHz
4. 10 kHz

89. If  $H(z)$  is the transfer function of an LTI system, then the inverse filter transfer function is

1.  $1/H(z)$
2.  $H(z^{-1})$
3.  $H^*(z)$
4.  $H^*(1/z^*)$

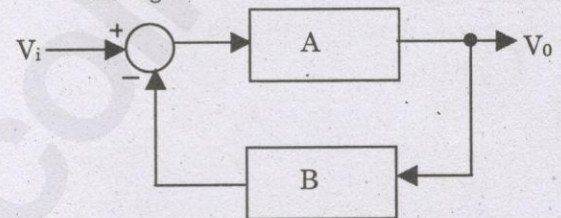
90. What is the nature of Fourier representation of a discrete and aperiodic signal?

1. Continuous and periodic
2. Discrete and aperiodic
3. Continuous and aperiodic
4. Discrete and periodic

91. If two systems with impulse responses  $h_1[n]$  and  $h_2[n]$  are connected in series. The overall impulse response is

1.  $h_1[n] \cdot h_2[n]$
2.  $h_1[n] + h_2[n]$
3.  $h_1[n] * h_2[n]$
4.  $h_1[n] - h_2[n]$

92. What is the voltage gain of the following arrangement?



1.  $A/(1+AB)$
2.  $B/(1+AB)$
3.  $(1+AB)/A$
4.  $(1+AB)/B$

93. The Nyquist plot of loop transfer function  $G(s)H(s)$  of a closed loop control system passes through the point  $(-1, j0)$  in the  $G(s)H(s)$  plane. The phase margin of the system is

1.  $0^\circ$
2.  $45^\circ$
3.  $90^\circ$
4.  $180^\circ$

94. Which of the following should be done to make an unstable system stable?

1. The gain of the system should be decreased
2. The gain of the system should be increased
3. The number of poles to the loop transfer function should be increased
4. The number of zeros to the loop transfer function should be increased

95. Phase margin of a system is used to specify which of the following?
1. Frequency response
  2. Absolute stability
  3. Relative stability
  4. Time response
96. The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
1. Unchanged
  2. Halved
  3. Doubled
  4. Increased by 50 percent
97. One of the following is an indirect way of generating FM. This is the
1. Reactance FET modulator
  2. Varactor diode modulator
  3. Armstrong modulator
  4. Reactance bipolar transistor modulator
98. Quantizing noise occurs in
1. Time-division multiplex
  2. Frequency-division multiplex
  3. Pulse-code modulation
  4. Pulse-width modulation
99. Time-division multiplex
1. Can be used with PCM only
  2. Combines five groups into a supergroup
  3. Stacks 24 channels in adjacent frequency slots
  4. Interleaves pulses belonging to different transmissions
100. Spiro meter is used to measure
1. Heart rate
  2. Respiration rate
  3. Pulse rate
  4. Lung volumes
101. Piezoelectric sensors are
1. Passive transducers
  2. Active transducers
  3. Both active and passive transducers
  4. Output transducers
102. Which term indicates the process of changing from the resting potential state to action potential state?
1. Polarization
  2. Propagation rate
  3. Depolarization
  4. None of the above
103. The frequency range 4 – 8 Hz corresponds to \_\_\_\_\_ type of brain waves.
1. Alpha wave
  2. Beta wave
  3. Theta wave
  4. Delta Wave
104. The components of a dialyser that do the functions of the kidney are
1. Membrane and dialysate
  2. Finger pump and roller pump
  3. Monitoring circuits
  4. Oxygenator
105. Atrial fibrillation is arrested by
1. Defibrillator in synchronized mode
  2. Defibrillator in instantaneous mode
  3. Pacemaker in demand mode
  4. All of the above

106. Which type of stimulation pulses is preferred in carrying out electro-diagnostic studies?
1. Constant current- voltage type
  2. Instantaneous voltage type
  3. Constant current type
  4. Constant voltage current type
107. Endorphin release theory is one of the working principles of
1. Bladder stimulator
  2. Cerebellar stimulator
  3. TENS
  4. Magnetic stimulator
108. The ultrasound signal travels through the tissue at a velocity of 1540 m/sec. The first acoustic impedance variation is at a depth of 3.08 cm from the skin level. Find the time taken by the signal from the transducer to reach again the skin level.
1.  $4 \times 10^{-2}$  ms
  2. 0.5 ms
  3.  $2 \times 10^{-2}$  ms
  4. 1 ms
109. The reason for the use of rotating type of anodes in conventional X-ray systems is
1. To reduce heat
  2. To increase the intensity of X-ray
  3. To harden the X-ray
  4. To reduce the width of the X-ray beam
110. Gamma emission consists of
1. Two protons and two neutrons
  2. Positively or negatively charged particle
  3. Electromagnetic energy
  4. None of the above
111. The need for the RF excitation pulse in MRI is
1. To flip the net magnetisation vector
  2. To generate magnetisation vector
  3. To decrease the magnetisation vector
  4. To nullify the magnetisation vector
112. A fluid in which a linear relation exists between shear stress and rate of shear strain is known as
1. Viscous fluid
  2. Newtonian fluid
  3. Viscoplastic fluid
  4. Shear thinning fluid
113. Voigt model for a viscoelastic fluid material has
1. Spring alone
  2. Dashpot alone
  3. Spring and dashpot in parallel
  4. Spring and dashpot in series
114. The hematocrit value is
1. Percentage volume of RBCs in blood
  2. Percentage volume of WBCs in blood
  3. Volume of plasma
  4. Number of blood cells in the blood
115. Bone is \_\_\_\_\_ material.
1. Homogenous
  2. Anisotropic
  3. Isotropic
  4. Stronger in tension