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Series : **a**

Question Booklet No.

Invigilator's Signature

ESE/25/RT/ETE/2025

ELECTRONICS AND COMMUNICATION ENGINEERING

Candidate's Signature

Time : 3 Hours **Maximum Marks : 200**

ROLL NO. | | | | | | |

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DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

1. Silicon in the diamond lattice is considered

[A] a good insulator because it has a completely filled valence band and an empty conduction band

[B] a good conductor because it has a large number of free electrons

[C] a poor conductor because it has a completely filled valence band and an empty conduction band

[D] a good semiconductor because it has an empty valence band and a completely filled conduction band

2. Which of the following statements ***correctly*** describes an insulator?

[A] It has a partially filled conduction band

[B] It allows easy flow of electrons under a small applied electric field

[C] It has a large forbidden energy band gap between the valence and conduction bands

[D] It conducts electricity better than a semiconductor

3. What is the approximate energy band gap of intrinsic Silicon (Si) at room temperature (300 K)?

[A] 0.3 V

[B] 0.7 eV

[C] 0.7 V

[D] 1.1 eV

4. A rectangular section of *n*-type silicon has a length of 1 mm and a cross-sectional area of 0.1 mm^2. What will be the resultant density of holes for this material when it has free electron density $5\times10^{13}/cm^3$ and electron and hole density for intrinsic silicon is $1.5\times10^{10}/cm^3$?

[A] $4.5\times10^{6}/cm^3$

[B] $7.5\times10^{6}/cm^3$

[C] $11.25\times10^{33}/cm^3$

[D] $16.66\times10^{13}/cm^3$

5. What is epitaxial growth?

[A] Growth of crystal in an amorphous substrate

[B] Deposition growth of a polycrystalline layer

[C] Growth of a single-crystal film from the gas phase upon an existing crystal wafer

[D] Growth of several crystal layers on different crystal substrates

6. In a crystal structure, the atomic bond of surface atoms is strongest in which of the following planes, resulting in the slowest dry etching and preferred crystal growth direction?

[A] (100) plane

[B] (111) plane

[C] (001) plane

[D] (110) plane

7. Which of the following is ***not*** a type of point defect commonly observed in a silicon crystal lattice?

[A] Vacancy

[B] Interstitial atom

[C] Substitutional impurity

[D] Dislocation

8. In a photolithography system, ultraviolet light with a wavelength (λ) of 248 nm is used in combination with an objective lens having a numerical aperture (NA) of 0.6. If the process factor (k_1) is 0.7, what is the practical limiting resolution in projection printing that can be achieved by the system?

[A] 127.54 nm

[B] 202.53 nm

[C] 212.57 nm

[D] 289.33 nm

9. In the context of measurement systems, precision of an instrument is

[A] expressed as the ratio of the magnitude of the measured quantity to the magnitude of the response

[B] a measure of the reproducibility of the measurements

[C] the closeness with which an instrument reading approaches the true value of the quantity being measured

[D] the smallest increment in input (the quantity being measured) which can be detected with certainty by an instrument

10. A moving coil voltmeter has a uniform scale with 100 divisions. The full-scale reading is 200 V and 1/10 of a scale division can be estimated with a fair degree of certainty. What is the resolution of the instrument?

[A] 0.1 V

[B] 1 V

[C] 0.2 V

[D] 2 V

11. The deflection angle of the pointer of an ideal moving iron ammeter is 20° for 1.0 A DC current. If a current of $2\sqrt{2}\sin(20t)$ A is passed through the ammeter, what will be the deflection angle?

[A] 20°

[B] 40°

[C] 80°

[D] 160°

12. To extend the range of a voltmeter, one should

[A] decrease its resistance

[B] connect a high-value resistor in series

[C] connect a low-value resistor in parallel

[D] use a shunt

13. The working principle of a strain gauge is based on

[A] change in capacitance

[B] magnetic flux variation

[C] change in resistance

[D] piezoelectric effect

14. A 4½-digit digital voltmeter is used for voltage measurements. What is its resolution on its 1 V range and how would 0.69 V be displayed on this range?

[A] 0.0001 V; 0.69

[B] 0.0001 V; 0.6900

[C] 0.001 V; 0.6900

[D] 0.01 V; 0.690

15. What is the main effect of an aging or weak battery in a series-type ohmmeter?

[A] The meter remains accurate due to built-in voltage compensation

[B] Deflection reduces, causing resistance readings to appear higher than actual

[C] The resistance scale becomes more linear

[D] The instrument functions normally until the battery is completely drained

16. The base-b representation of a number is $(121)_b$. If its decimal equivalent is 16, what is the value of b?

[A] 2

[B] 3

[C] 8

[D] 16

17. Given the Boolean expression :

$$F = AB + \bar{A}C + BC$$

What is the simplified form of F?

[A] $AB + BC$

[B] $\bar{A}C + BC$

[C] $AB + \bar{A}C$

[D] ABC

18. Given access to only 2-input NOR gates, which one of the following Boolean expressions can be implemented using exactly four 2-input NOR gates?

[A] $A.B.C$

[B] $A + B + C$

[C] $A \oplus B \oplus C$

[D] $A \odot B \odot C$

19. A 4×16 decoder is implemented using two 3×8 decoders. Assuming that all select lines and data inputs are properly connected, which of the following logic gates is sufficient and necessary to complete the 4×16 decoder configuration?

[A] AND gate

[B] NOT gate

[C] OR gate

[D] XNOR gate

20. Which of the following best characterizes the behavior of a sequential circuit in contrast to a combinational circuit?

[A] The output of the circuit is determined solely by the current input values

[B] The circuit behaves identically to a combinational circuit if inputs are applied slowly

[C] The output is determined only by the initial state and not affected by future inputs

[D] The output is determined by the order and timing of inputs along with the circuit's internal memory

21. Characteristic equation of JK flip-flop is

[A] $Q_{n+1} = \bar{Q}_n J + Q_n \bar{K}$

[B] $Q_{n+1} = Q_n \bar{J} + \bar{Q}_n K$

[C] $Q_{n+1} = \bar{Q}_n \bar{J} + Q_n K$

[D] $Q_{n+1} = Q_n J + \bar{Q}_n \bar{K}$

22. In a 4-bit serial-in serial-out (SISO) shift register, how many clock pulses are needed to fully load and then fully unload a 4-bit sequence?

[A] 4

[B] 8

[C] 6

[D] 10

23. A traffic signal cycles from Green to Yellow, Yellow to Red and Red to Green. In each cycle, Green is turned on for 60 seconds. Yellow is turned on for 5 seconds and the Red is turned on for 55 seconds. This traffic lights has to be implemented using D flip-flop. The only input to this flip-flop is a clock of 5 second's period. The minimum number of flip-flops required to implement this traffic light is

[A] 4

[B] 5

[C] 12

[D] 60

24. A successive approximation A/D converter has a resolution of 20 mV. What will be the 8-bit digital output for an analog input of 2.54 V?

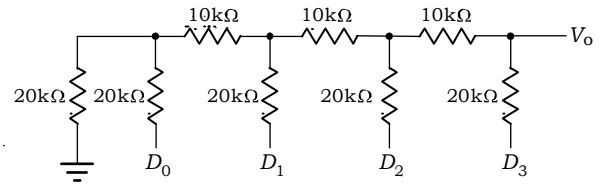
[A] 01111111

[B] 10000001

[C] 01111110

[D] 01010101

25. What is the analog output voltage for the digital input 0110_2 in the given 4-bit R-2R ladder DAC with a reference voltage of +16 V?



[A] 4 V

[B] 6 V

[C] 8 V

[D] 10 V

26. How many memory chips of size 1024×1 are needed to build an 8K-byte memory?

[A] 8

[B] 16

[C] 32

[D] 64

27. Which of the following statements about the INTR interrupt in the 8086 microprocessor is ***incorrect***?

[A] INTR is a level-triggered interrupt

[B] INTR is a positive edge-triggered interrupt

[C] INTR is a hardware interrupt

[D] When IF = 0, INTR is disabled

28. Which of the following is ***not*** a valid data memory addressing mode in 8086?

[A] Direct addressing mode

[B] Register addressing mode

[C] Base addressing mode

[D] Index addressing mode

29. How many bytes and machine cycles are required to execute the instruction STA 2300H in the 8085 microprocessor?

[A] 2-byte instruction, 2 machine cycles

[B] 2-byte instruction, 3 machine cycles

[C] 3-byte instruction, 3 machine cycles

[D] 3-byte instruction, 4 machine cycles

30. In 8051, how many interrupt sources are there, including the reset?

[A] 6

[B] 7

[C] 8

[D] 16

31. In an 8051-based system, how many minimum address lines are required to interface a 512-byte RAM using byte-wise data organization?

[A] 6

[B] 9

[C] 16

[D] 18

32. What is the role of MAX232 in a system where an LM35 sensor sends temperature data from an 8051 microcontroller to a PC via RS-232?

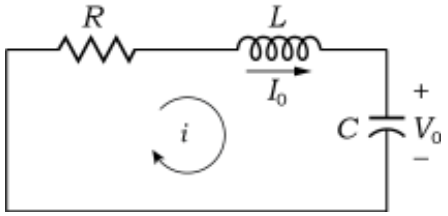
[A] Acts as a UART module

[B] Provides memory address decoding

[C] Converts TTL voltage levels to RS-232 levels and vice versa

[D] Converts serial data to parallel data

33. What is the characteristic equation of the given *R-L-C* circuit shown in the figure?



[A] $s^2+\frac{R}{L}s+\frac{1}{LC}=0$

[B] $s^2+\frac{s}{RC}+\frac{1}{LC}=0$

[C] $s^2+\frac{s}{RL}+\frac{R}{C}=0$

[D] $s^2+\frac{R}{L}s+\frac{L}{C}=0$

34. If a class *C* power amplifier has an input signal with frequency of 200 kHz and the width of collector current pulses of 0.1 µs, then the duty cycle of the amplifier will be

[A] 1%

[B] 2%

[C] 10%

[D] 20%

35. Thevenin's theorem states that any linear, bilateral network can be replaced by an equivalent circuit with

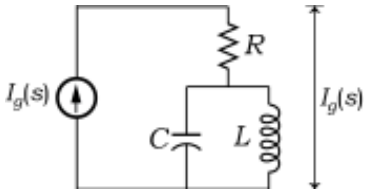
[A] an ideal voltage source only

[B] a voltage source in series with a resistor

[C] a current source in series with a resistor

[D] a current source in parallel with a resistor

36. In the circuit shown, a current source $I_g(s)$ excites a network consisting of a resistor *R*, inductor *L* and a capacitor *C*. The voltage response is measured across the same terminals as the current source. What is the driving-point impedance *H*(s)?



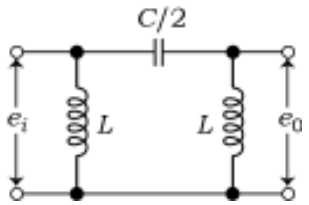
[A] $R+\frac{L}{1+s^2\sqrt{LC}}$

[B] $\frac{sL}{R+(1+e^{\sqrt{LC}})}$

[C] $R+\frac{sL}{1+s^2LC}$

[D] $\frac{\frac{RL}{sC}}{1+s^2LC}$

37. The following configuration filter



is for

[A] π section low pass filter

[B] π section high pass *LC* filter

[C] π section band pass *LC* filter

[D] π section band reject *LC* filter

38. Active filters are preferred over passive filters for low-frequency applications because

[A] they can provide high gain, very simple roots using inductors and the absence of a feedback circuit

[B] they can provide desire gain, complex roots using feedback circuits and eliminate inductors

[C] they consume less power and provide a simple root due to the absence of a feedback circuit

[D] they offer better noise elimination due to the use of inductors and the absence of a feedback circuit

39. The input power to a speaker suppression filter is 100 mW and the output power is 10 mW to minimize noise. What is the attenuation, in decibels, offered by the filter?

[A] 3 dB attenuation

[B] 7 dB attenuation

[C] 10 dB attenuation

[D] 20 dB attenuation

40. If the resistance of a transmission line is $R\,\Omega/\text{m}$, the inductance is L H/m, the capacitance between the two conductors is C F/m and the conductance is G S/m, then what is the velocity of propagation on a lossless transmission line?

[A] $\frac{1}{\sqrt{LC}}$

[B] $\sqrt{LC}$

[C] $\frac{1}{\sqrt{RC}}$

[D] $\sqrt{RG}$

41. What does the propagation constant (γ) represent in a transmission line?

[A] The attenuation and characteristic impedance of the line per unit length

[B] The phase shift and characteristic impedance of the line per unit length

[C] The signal amplitude and characteristic impedance of the line per unit length

[D] The attenuation and phase shift per unit length

42. What is the primary purpose of using a quarter-wave transformer in transmission lines?

[A] To increase the current and the frequency of the source for efficient transmission

[B] To match the load impedance to the source impedance

[C] To step up the output voltage to one-fourth of the input voltage

[D] To step down the output voltage to one-fourth of the input voltage

43. In an amplifier circuit, if the open-loop gain is 120 dB and the output voltage is 10 V, then the differential input voltage should be

[A] 10 μV

[B] 0.1 V

[C] 100 μV

[D] 1 μV

44. Which of the following statements about the Smith chart is ***correct***?

[A] The Smith chart is a semi-log chart, used for unknown microwave frequency measurement

[B] The Smith chart is a polar plot of the voltage reflection coefficient on a transmission line

[C] The Smith chart is primarily a polar semi-log plot of voltage and current on a transmission line

[D] The Smith chart is primarily a Cartesian plot of voltage and current on a transmission line

45. The Fourier transform of a delta function $\delta(t)$ is

[A] 1

[B] 0

[C] $\delta(f)$

[D] $e^{-j2\pi ft}$

46. Which component is typically added in series with an SCR to limit di/dt?

[A] Resistor in series with diode

[B] Resistor in series with triode

[C] Diode

[D] Inductor

47. What is the function of the gate terminal in a TRIAC?

[A] It reverse biases the junction J_1

[B] It blocks the forward current

[C] It increases the breakdown voltage at a higher breakover voltage

[D] It allows control of breakover at a lower forward voltage

48. Which of the following statements about a DIAC is ***correct***?

[A] A DIAC has a gate terminal and conducts only in one direction when the voltage exceeds 0.7 V and behaves like high impedance

[B] The leads of a DIAC are interchangeable and it requires a gate signal to conduct

[C] The leads of a DIAC are not interchangeable and it requires a gate signal to conduct

[D] The leads of a DIAC are interchangeable and it does not require a gate signal to conduct

49. Why is forced commutation necessary in inverter circuits using thyristors?

[A] Because thyristors naturally turn off at zero-crossing

[B] Because thyristors remain forward biased and do not turn off on their own

[C] Because voltage-fed inverters generate harmonics

[D] To increase the voltage gain of the inverter

50. In a series connection of two DC-DC converters having conversion ratio $M_1(D)$ and $M_2(D)$ of 1st and 2nd converters respectively, then the overall conversion ratio $M(D)$ is given by which of the following?

[A] $M(D) = M_1(D) + M_2(D)$

[B] $M(D) = M_1(D) - M_2(D)$

[C] $M(D) = \dfrac{M_1(D)}{M_2(D)}$

[D] $M(D) = M_1(D) \times M_2(D)$

51. A step-down chopper has an input voltage of 200 V and a duty cycle of 40%. What is the average output voltage?

[A] 80 V

[B] 80 sin(200t) V

[C] 200 sin(0.4t + 80) V

[D] 200 sin(200t + 80) V

52. If at the temperature T_1°C the reverse saturation current of p-n junction is I_{01}A. The expression for reverse saturation current $I_0(T)$ as a function of temperature is given by

[A] $I_0(T) = I_{01} \times 2^{(T-T_1)/5}$

[B] $I_0(T) = I_{01} \times 2^{(T-T_1)/10}$

[C] $I_0(T) = I_{01} \times e^{(T-T_1)/10}$

[D] $I_{01}(T) = I_0 \times e^{(T_1-T)/10}$

53. The maximum efficiency of a full-wave rectifier without any capacitor is

[A] 40.6%

[B] 81.2%

[C] 100%

[D] 50%

54. An n-p-n transistor has a common-emitter current gain 11.5. In a common-base configuration, the emitter current is 1 mA. When the emitter circuit is open, the collector leakage current is 50 μA. What is the total collector current?

[A] 0.87 mA

[B] 0.95 mA

[C] 0.97 mA

[D] 1.05 mA

55. Why is the operating point also called the quiescent or Q-point?

[A] Because it represents the maximum output power with highest Q factor

[B] Because it represents thermal stability to minimized Q factor

[C] Because it is the point when the transistor is in cut-off region

[D] Because it is the point on the I_c vs. V_{CE} curve without input signal

56. What is the early effect in a Bipolar Junction Transistor?

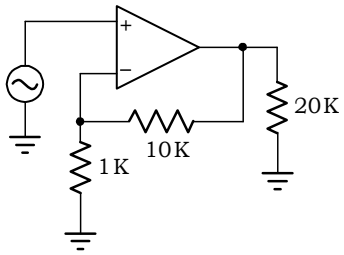
[A] Decrease in base width due to increase in collector-base voltage

[B] Increase in base width due to increase in collector-base voltage

[C] Increase in base current with increasing collector current

[D] Decrease in collector current with increasing base-emitter voltage

57. In the given figure if the input voltage at the non-inverting terminal is $30\sin(2\pi 50t + \pi/6)\text{V}$, what are the input impedance and gain of the circuit for an ideal OP-Amp?



[A] Input impedance ∞, Gain –10

[B] Input impedance ∞, Gain 11

[C] Input impedance 0, Gain –10

[D] Input impedance 0, Gain 11

58. What does the input offset voltage of an operational amplifier represent?

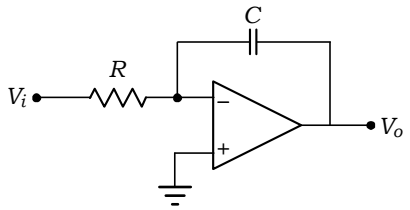
[A] The voltage required to achieve maximum gain in an op-amp

[B] The voltage applied between the inverting and non-inverting terminals to make the output zero, when the ideal input is zero

[C] A feedback register connected between the output and input terminals to ensure that the output is zero, when the ideal input is zero

[D] The maximum voltage difference between the output and the ground to ensure that the output is as desired

59. In the given figure if input signal is square wave $v_i(t)$, then output will be



[A] $-RC\dfrac{dv_i(t)}{dx}$, square wave

[B] $-RC\dfrac{dv_i(t)}{dx}$, triangular wave

[C] $-\dfrac{1}{RC}\int v_i(t)dt + c_i$, square wave

[D] $-\dfrac{1}{RC}\int v_i(t)dt + c_i$, triangular wave

60. Which one is ***not*** valid feedback-amplifier topologies?

[A] Voltage amplifier with voltage-series feedback

[B] Transconductance amplifier with current-series feedback

[C] Transresistance amplifier with voltage-shunt feedback

[D] Transresistance amplifier with current shunt feedback

61. The response $c(t)$ of a system is described by the differential equation

$$\frac{d^2c(t)}{dt^2} + 4\frac{dc(t)}{dt} + 5c(t) = 0$$

The system response is

[A] undamped

[B] underdamped

[C] critically damped

[D] oscillatory

62. The condition of a stable amplifier with regenerative feedback is

[A] product of gain and return ratio = 1

[B] product of gain and return ratio < 1

[C] product of gain and return ratio > 1

[D] not related to this product

63. A broadcast, radio amplitude modulated signal transmitter radiates 11.8 kilowatts when the modulation percentage is 60. How much of this is carrier power?

[A] 7.08 kW

[B] 10 kW

[C] 11.8 kW

[D] 17.08 kW

64. Frequency deviation in FM is

[A] change in carrier phase related to the frequency variation above and below the center frequency

[B] ratio of maximum departure of the carrier frequency to the frequencies of the modulating signal

[C] the permitted maximum departure of the carrier frequency from its initial value for FM

[D] elimination of sidebands frequency above and below the center frequency

65. How can a demodulator for Phase Modulation (PM) be implemented using FM discriminator?

[A] Balanced demodulator followed by a differentiator

[B] Using a phase-locked loop followed by an FM limiter

[C] Using an FM limiter followed by an integrator

[D] An integrator followed by the FM discriminator

66. What is the main reason for using pulse shaping filters like the identical raised cosine filter in digital communication in both transmitter and receiver section?

[A] To minimize inter-symbol interference (ISI)

[B] To increase signal amplitude by reducing ripples

[C] To improve frequency selection by filtering method

[D] To filter unwanted frequency of the carrier signal

67. Which of the following is ***not*** a true statement about Pulse Code Modulation (PCM)?

[A] It requires precise timing and synchronization

[B] It consumes more power than analog systems

[C] It offers high immunity to noise and interference

[D] It requires less use of codewords by using higher number of bits with minimum transmission rate

68. What is the role of a phase-recovery circuit in coherent modulation schemes?

[A] To synchronize the local oscillator in frequency and phase with the transmitter

[B] To filter out the modulating signal in an asynchronous manner

[C] To remove quantization noise using a phase-recovery circuit

[D] To boost the signal power by using a coherent source

69. Which of the following statements ***correctly*** describes Amplitude Shift Keying (ASK)?

[A] The frequency of the carrier is varied according to the input signal, while amplitude remains constant

[B] The phase of the carrier is reversed when the input signal changes

[C] The carrier is transmitted only when the input signal is zero

[D] The amplitude of the carrier changes according to the input signal, while frequency and phase remain constant

70. How can an FSK signal be interpreted in terms of ASK?

[A] As a sum of two interleaved ASK signals at different frequencies

[B] As a single ASK signal with a varying amplitude

[C] As an ASK signal modulated by a sinusoidal signal

[D] As an ASK signal with reduced bandwidth

71. What is the primary cause of thermal noise in communication system?

[A] Signal reflection from mismatched transmission lines

[B] Random motion of electrons in conductors and receiver components

[C] External electromagnetic interference

[D] Variations in power supply voltage

72. Compared to ASK and FSK, PSK is

[A] less power efficient

[B] more bandwidth consuming

[C] less immune to noise

[D] more power efficient

73. A source delivers symbols X_1, X_2, X_3 and X_4 with probabilities 1/2, 1/4, 1/8 and 1/8 respectively. The entropy of the system is

[A] 1.75 bits per second

[B] 1.75 bits per symbol

[C] 1.75 symbols per second

[D] 3.56 bits per symbol

74. What is the primary role of the BSS (Base Station Subsystem) in a GSM network?

[A] To encrypt user data before NSS transmission

[B] To switch calls between different MSCs

[C] To handle billing and subscriber information

[D] To manage radio transmission paths and the interface between mobile stations and other GSM subsystems

75. The frequency modulated voltage wave is given as

$V = 10\sin(2\pi \times 10^8 t + 5\sin 400\pi t)$

The carrier frequency and maximum frequency deviation of the signal are respectively

[A] 10 MHz, 10 kHz

[B] 100 MHz, 1 kHz

[C] 10 MHz, 1 kHz

[D] 100 MHz, 10 kHz

76. Bluetooth is designed to operate in an environment of many users and up to eight devices can communicate in a small network which is called a

[A] Micronet

[B] Picocell

[C] Piconet

[D] Mininet

77. What is the primary reason for cell splitting in mobile networks?

[A] To reduce handoff frequency

[B] To increase coverage area

[C] To reduce signal interference

[D] To increase network capacity in high-traffic areas

78. A series *R-L-C* circuit has a resonant frequency of 1 kHz and quality factor Q of 100. If each of R, L and C is doubled from its original value, the new Q of the circuit is

[A] 25

[B] 50

[C] 100

[D] 200

79. A source of angular frequency 1 radian/s has source impedance consisting of 1 Ω in series with 1 H inductance. The load that will obtain maximum power transfer is

[A] 1 Ω resistor parallel to 1 H inductor

[B] 1 Ω resistor in series with 1 H inductor

[C] 1 Ω resistor only

[D] 1 Ω resistor in series with 1 F capacitor

80. The channel length modulation effect in MOSFET causes

[A] decrease in drain current

[B] increase in drain current

[C] decrease in source current

[D] damage to MOSFET

81. In a simple passive *R-C* based-low-pass filter, the desired cut-off frequency is 3.4 kHz and $C = 10$ nF. The value of R would be

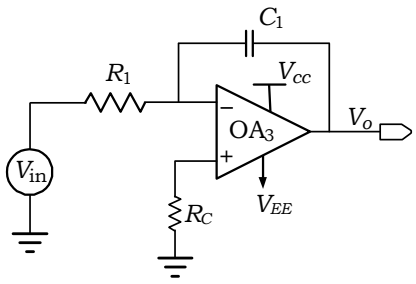
[A] 5 kΩ

[B] 10 kΩ

[C] 3.3 kΩ

[D] 6.8 kΩ

82. The op-amp circuit shown below presents a



[A] simple integrator

[B] lossy integrator

[C] differentiator

[D] high-pass filter

83. If the DC milliampere of current range 0-500 mA uses a PMMC instrument of coil resistance R_m and full-scale deflection current, I_{FSD} of 1 mA, the required shunt resistance R_{SH} is related to R_m as

[A] $R_{SH} > R_m$

[B] $R_{SH} = R_m$

[C] $R_{SH} < R_m$

[D] $R_{SH} = R_m^2$

84. The VSWR can have any value between

[A] 0 and 1

[B] 1 and ∞

[C] –1 and +1

[D] 0 and ∞

85. De Morgan's theorem states that the complement of $(A + B + C)$ is

[A] $(C + B + A)$

[B] $A.B.C$

[C] $A' + B' + C'$

[D] $A'.B'.C'$

86. The carry output of a full adder can be given by

[A] $AB + BC + AC$

[B] $A + B + C$

[C] $A.B.C$

[D] $A' + B' + C'$

87. The 8085 microprocessor has how many address lines?

[A] 8

[B] 16

[C] 32

[D] 64

88. The potential problem that occurs when down sampling without proper filtering is

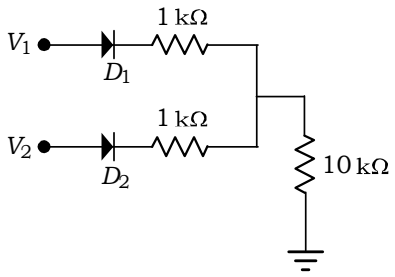
[A] noise amplification

[B] aliasing

[C] phase distortion

[D] amplitude clipping

89. The diode circuit shown below works as



[A] OR gate

[B] AND gate

[C] NAND gate

[D] NOR gate

90. Charge scaling digital-to-analog converter uses

[A] $R/2R$ resistors in ladder form

[B] weighted resistors

[C] weighted capacitors strings in parallel

[D] many R-C networks

91. The condition for a transmission line to become distortionless is

[A] $RL = 1/(RC)$

[B] $GL = RC$

[C] $LR = CG$

[D] $LR = LC$

92. Which of the following is a key enabling technology for 5G?

[A] CDMA

[B] OFDMA and massive MIMO

[C] GSM

[D] AMPS

93. Faraday rotation caused at the ionosphere boundary ***does not*** affect which polarization processes?

[A] Horizontal polarization

[B] Vertical polarization

[C] Circular polarization

[D] Linear polarization

94. Electronic single-phase fan regulator uses

[A] DIAC

[B] TRIAC

[C] POT

[D] the combination of all

95. In a single-phase full converter, the average output DC voltage is maximum when firing trigger angle is

[A] 90°

[B] 0°

[C] 45°

[D] 60°

96. If a Si wafer with an intrinsic carrier concentration of $10^{10}\,cm^{-3}$ is doped with $5\times10^{15}\,cm^{-3}$ phosphorus and $10^{16}\,cm^{-3}$ boron at room temperature (300 K), then what is the doping in the resultant silicon?

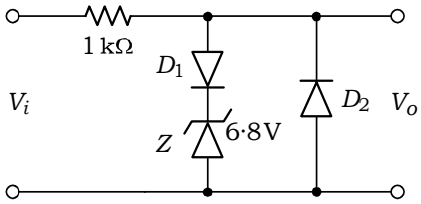
[A] Intrinsic

[B] *n*-type

[C] *p*-type

[D] Unpredictable

97. In the following limiter circuit, an input voltage $V = 10\sin 100\pi t$ is applied. Assume that the diode drop is 0.7 V when it is forward biased. The Zener breakdown voltage is 6.8 V.



The maximum and minimum values of the output voltage respectively, are

[A] 6.1 V, –0.7 V

[B] 0.7 V, –7.5 V

[C] 7.5 V, –0.7 V

[D] 7.5 V, –7.5 V

98. The principle of voltage to time conversion is used in

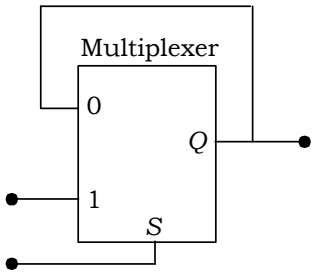
[A] dual slope type DVM

[B] successive approximation type DVM

[C] integrating type DVM

[D] None of the above

99. The output of a 2-input multiplexer is connected back to one of its inputs as shown in the figure



The functional equivalence of this circuit matches to which one of the following options?

[A] D flip-flop

[B] D latch

[C] Half adder

[D] Demultiplexer

100. The single-phase full bridge inverter produces which of the following outputs?

[A] Pure sinusoidal output

[B] Unidirectional square wave

[C] Bi-polar square wave

[D] DC voltage

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PROVISIONAL ANSWER KEY OF
ARUNACHAL ENGINEERING SERVICE
(RECRUITMENT TEST) EXAMINATION-2025
ELECTRONICS & COMMUNICATION ENGINEERING
SET- A

Q NO.	ANS
1	C
2	C
3	D
4	A
5	C
6	D
7	D
8	D
9	B
10	C
11	C
12	B
13	C
14	B
15	B
16	B
17	C
18	B
19	B
20	D
21	A
22	B
23	B
24	A
25	B

Q NO.	ANS
26	D
27	B
28	B
29	D
30	A
31	B
32	C
33	A
34	B
35	B
36	C
37	B
38	B
39	C
40	A
41	D
42	B
43	A
44	B
45	A
46	D
47	D
48	D
49	B
50	D

Q NO.	ANS
51	A
52	B
53	B
54	C
55	D
56	A
57	B
58	B
59	D
60	D
61	D
62	B
63	B
64	C
65	D
66	A
67	D
68	A
69	D
70	A
71	B
72	D
73	B
74	D
75	D

Q NO.	ANS
76	C
77	D
78	B
79	D
80	B
81	A
82	A
83	C
84	B
85	D
86	A
87	B
88	B
89	A
90	C
91	B
92	B
93	C
94	D
95	B
96	C
97	C
98	A
99	B
100	C