# MIZORAM PUBLIC SERVICE COMMISSION

## TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF

## INSPECTOR OF LEGAL METROLOGY

## UNDER FOOD, CIVIL SUPPLIES & CONSUMER AFFAIRS, GOVT. OF MIZORAM

## NOVEMBER, 2023

## ELECTRICAL ENGINEERING PAPER-III

Time Allowed : 2 hours Full Marks : 200

*All questions carry equal marks of 2 each.*
*Attempt all questions.*

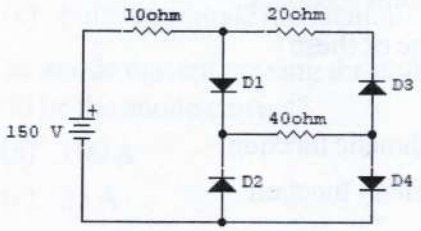
**1.** When a trivalent impurity is added to a pure semiconductor it becomes

(a) an insulator
(b) an intrinsic semiconductor
(c) p-type semiconductor
(d) n-type semiconductor

**2.** What is incorrect option for a reverse biased p-n junction diode

(a) the width of depletion layer increases
(b) the potential barrier is reduced
(c) the junction offers very high resistance
(d) no current flow in the circuit

**3.** What will be the current through 40 ohm resistor in the circuit shown below? Assume all diodes are ideal.




(a) 3.75 A
(b) 2.5 A
(c) 5 A
(d) 3 A

**4.** An applied ac voltage to a full wave bridge rectifier is 50 V, what is the dc output voltage?

(a) 22.5 V
(b) 15.92 V
(c) 45 V
(d) 50 V

**5.** A zener diode is primarily used as

(a) an oscillator
(b) a rectifier
(c) an amplifier
(d) a voltage regulator

**6.** The main difference between J-K and R-S flip-flop is that

(a) J-K flip flop does not need a clock pulse
(b) there is feedback in J-K flip-flop
(c) J-K flip-flop accepts both inputs as 1
(d) J-K flip-flop is acronym of junction cathode multivibrator

7. In a common base connection of npn-transistor, current amplification factor is 0.92. If the emitter current is 1.2 mA, what is the value of base current?
   (a) 1.104 mA (b) 0.92 mA
   (c) 0.096 mA (d) 0.092 mA

8. The relation between current gains á and ã of a transistor is
   (a) $\gamma = \frac{1-\alpha}{\alpha}$ (b) $\gamma = \frac{\alpha}{1-\alpha}$
   (c) $\gamma = \frac{\alpha}{1+\alpha}$ (d) $\gamma = \frac{1}{1-\alpha}$

9. Which one is not a transistor biasing method?
   (a) base resistor method (b) emitter bias method
   (c) voltage-divider bias method (d) current-divider bias method

10. The microprocessor works on the principle of
   (a) binary arithmetic (b) decimal arithmetic
   (c) both the decimal and binary arithmetic (d) none of these

11. The purpose of a coupling capacitor in a transistor amplifier is to
   (a) protect the transistor (b) pass ac-component and block dc-component
   (c) increase the output impedance of transistor (d) provide biasing

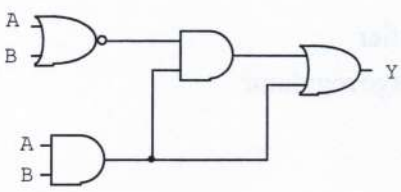
12. How many stages of amplification is/are required in a radio receiver?
   (a) one stage (b) two stages
   (c) three stages (d) more than three stages

13. What kind of feedback circuit is called the emitter follower?
   (a) voltage feedback (b) current feedback
   (c) both voltage and current feedback (d) none of these

14. The ROM of a microprocessor system contains
   (a) control function (b) arithmetic function
   (c) monitor program (d) memory function

15. A zener voltage regulator has $V_Z = 20V$. The input voltage may vary from 26 V to 40 V and load current from 20 mA to 100 mA. To keep the load voltage constant under all conditions, what should be the value of series resistance of the voltage regulator?
   (a) 50 Ω (b) 60 Ω
   (c) 200 Ω (d) 300 Ω

16. What is the expression of Y in terms of A and B for the logic gate circuit shown below?




   (a) $\left((\overline{A+B}).AB\right).AB$ (b) $\left(\overline{AB}+AB\right).AB$
   (c) $\left((\overline{A+B}).AB\right)+AB$ (d) $\left(\overline{A+B}+AB\right)+AB$

17. An SCR starts conducting when the anode current reaches at
    (a) latching current (b) holding current
    (c) equal to gate current (d) none of these

18. By increasing the light intensity, the reverse current in a photo-diode
    (a) remains unaffected (b) increases
    (c) decreases (d) None of these

19. In a single-phase pulse modulation of a PWM inverter, $7^{th}$ harmonic can be eliminated if pulse width is
    (a) 40° (b) 51.4°
    (c) 72.4° (d) 120°

20. Which logic gates are called universal gates?
    (a) AND gate and OR gate (b) AND gate and NOT gate
    (c) NAND gate and NOT gate (d) NAND gate and NOR gate

21. A capacitor filter at the output of a rectifier results in ripple which
    (a) increases with increase of load resistance
    (b) decreases with increase of load resistance
    (c) remain unchanged with increase of load resistance
    (d) remain unchanged with decrease of load resistance

22. How many stable states are there in a flip-flop?
    (a) One (b) Two
    (c) Three (d) No stable state

23. The forward voltage drop across an on-state thyristor
    (a) remains constant and is independent of load current
    (b) increases slightly with increase of load current
    (c) decreases slightly with increase of load current
    (d) varies linearly with the load current

24. In the toggle mode, a J-K flip-flop has
    (a) J = 0, K = 1 (b) J = 1, K = 0
    (c) J = 0, K = 0 (d) J = 1, K = 1

25. A digital circuit that can store only one bit is
    (a) flip-flop (b) NOR gate
    (c) register (d) XOR gate

26. The V-I characteristics of a diode lie in the
    (a) $1^{st}$ quadrant (b) $2^{nd}$ quadrant
    (c) $1^{st}$ and $2^{nd}$ quadrant (d) $1^{st}$ and $3^{rd}$ quadrant

27. The S-R flip-flop can be converted to T flip-flop by
    (a) S is connected to Q (b) R is connected to Q
    (c) shorting S and R (d) S is connected to Q'

28. The gate voltage in a JFET at which drain current becomes zero is called
    (a) saturation voltage (b) active voltage
    (c) pinch-off voltage (d) cut-off voltage

29. Which statement is correct for a load commutated chopper?
    (a) It is capable of commutating any amount of load current.
    (b) No commutating inductor is required.
    (c) As it work at high frequencies in order of kHZ, filtering requirements are minimal.
    (d) All of these

30. The clocks of synchronous counter change for each flip-flop
    (a) simultaneously (b) not simultaneously
    (c) at any moment (d) randomly

31. The number of bits that indicates the status of accumulator in a microprocessor is called
    (a) data (b) logic
    (c) flag (d) word

32. A single-phase full converter operates as an inverter, when
    (a) $0° \leq \propto \leq 90°$
    (b) $90° \leq \propto \leq 180°$
    (c) $90° \leq \propto \leq 180°$ and there is a suitable dc source in the load circuit
    (d) it supplies to a back-emf load

33. The time taken by the microprocessor to perform a specific task is called the
    (a) machine cycle (b) instruction cycle
    (c) fetch cycle (d) clock cycle

34. Gate pulse of the SCR is used to
    (a) turn-off the SCR (b) turn-on the SCR
    (c) turn-on and turn-off the SCR (d) continuous controlling the SCR

35. A program written in binary sequence is called
    (a) object program (b) source program
    (c) main program (d) machine program

36. A section of consecutive memory location working on principle of LIFO is called
    (a) accumulator (b) resister
    (c) stack (d) pointer

37. Which statement is true for low level amplitude modulation?
    (a) minimum RF power is required (b) maximum RF power is required
    (c) all RF amplifiers are of class A (d) all RF amplifiers can be linear

38. Which noise is a static kind of noise which is generated due to electric disturbances?
    (a) extraterrestrial noise (b) atmospheric noise
    (c) shot noise (d) industrial noise

39. What type of modulation is the process in which amplitude of carrier signal changes with respect to modulating signal?
    (a) frequency modulation (b) pulse modulation
    (c) angle modulation (d) amplitude modulation

**40.** The string voltage of 5 SCRs are connected in a series string is 2.8 kV. Each SCR voltage rating is 600 V, the derating factor is

(a) 5.2% (b) 6.1%

(c) 6.7% (d) 7.6%

**41.** What are the noises are considered as internal noise?

(a) atmospheric noise and extraterrestrial noise

(b) resistor noise, shot noise, and transient noise

(c) industrial and miscellaneous noises

(d) none of these

**42.** Which of the following are the examples of digital communication?

(a) photocopiers (b) audio tapes

(c) emails (d) both (a) & (c)

**43.** The analog communication is disadvantageous compared to digital communication, because

(a) it is having less noise (b) it is free from noise

(c) it is having noise of high amplitude (d) it is having maximum frequency

**44.** Which portion of a semiconductor transistor is heavily doped

(a) emitter (b) base

(c) collector (d) all are equally doped

**45.** The process of conversion of data along with its formatting is called

(a) modulation (b) formatting

(c) amplifying (d) source coding

**46.** A single-phase full bridge inverter operates in load commutation mode under

(a) RL load (b) RLC underdamped load

(c) RLC overdamped load (d) RLC critically damped load

**47.** In a frequency modulation broadcast, the maximum deviation is 90 kHz, and the maximum modulating frequency is 10 kHz. In reference to Carson's rule, what would be the maximum required bandwidth?

(a) 90 kHz (b) 100 kHz

(c) 110 kHz (d) 200 kHz

**48.** If a 120 V carrier peak changes from 160 V to 40 V by a modulating signal, the modulation factor is

(a) 0.5 (b) 0.6

(c) 0.75 (d) 3

**49.** Which modulator is an indirect way of generating FM signal?

(a) Inductance FET modulator (b) Reactance tube modulator

(c) Armstrong modulator (d) Zener diode modulator

**50.** In a frequency modulation system, the maximum frequency deviation is 2 kHz, and modulating frequency is 2 kHz. The modulation index is

(a) 1 (b) 2

(c) 3 (d) 4

**51.** In a 60 Hz, three-phase full converter, the ripple frequency in the output voltage is

(a) 60 Hz (b) 120 Hz

(c) 180 Hz (d) 360 Hz

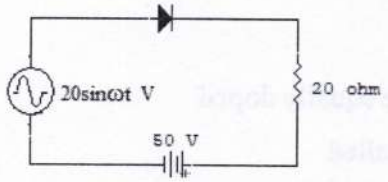
**52.** As compared to BJT, a power MOSFET has
(a) lower switching losses but higher conduction loss
(b) higher switching losses and higher conduction loss
(c) higher switching losses but lower conduction loss
(d) lower switching losses and lower conduction loss

**53.** An IGBT has three terminals called
(a) collector, emitter, and base
(b) drain, source, and base
(c) drain, source, and gate
(d) collector, emitter, and gate

**54.** In the conduction of Schottky diode
(a) only holes can participate
(b) only electrons can participate
(c) both electrons and holes participate
(d) none of these

**55.** Schottky diode junction is between
(a) two similar semiconductors
(b) two dissimilar semiconductors
(c) semiconductor and metal
(d) semiconductor and insulator

**56.** The peak inverse voltage required for the diode shown in the circuit below is




(a) 20 V
(b) 30 V
(c) 50 V
(d) 70 V

**57.** The ratio of holding current to the latching current of a thyristor is
(a) 0.3
(b) 0.4
(c) 1.0
(d) 2.5

**58.** Which is not a triggering method of a thyristor?
(a) Gate triggering
(b) dv/dt triggering
(c) current triggering
(d) light triggering

**59.** The gate-cathode characteristic of an SCR has a straight line of slope 130. What would be the gate-source resistance for trigger source voltage of 15 V and allowable gate power dissipation of 0.5 W?
(a) 102 Ω
(b) 112 Ω
(c) 122 Ω
(d) 152 Ω

**60.** The di/dt is limited in the thyristor by using
(a) snubber circuit
(b) an inductor
(c) a resistor
(d) a capacitor

**61.** If an inductor is connected in series with anode circuit of an SCR, the turn-on time of the SCR
(a) remains unchanged
(b) decreases
(c) increases
(d) random time

**62.** A triac is equivalent to
(a) two diodes connected in antiparallel
(b) one thyristor and one diode connected in parallel
(c) two thyristors are connected in parallel
(d) two thyristors are connected in antiparallel

**63.** The correct sequence of the given device in a decreasing order of their speed of operation is

(a) power BJT, PMOSFET, IGBT, SCR
(b) IGBT, PMOSFET, power BJT, SCR
(c) SCR, power BJT, IGBT, PMOSFET
(d) PMOSFET, IGBT, power BJT, SCR

**64.** The unit that supervises each instruction in the microprocessor is

(a) control unit
(b) accumulator
(c) arithmetic logic unit (ALU)
(d) instruction set

**65.** A single-phase half-wave controlled rectifier has 800sin (314t) volts as the input voltage and $R_L$ as the load. For a firing angle of 60° for the SCR, the average output voltage is

(a) $300/\pi$ volts
(b) $400/\pi$ volts
(c) $500/\pi$ volts
(d) $600/\pi$ volts

**66.** A program that translates symbolic instructions into binary equivalent is called

(a) loader
(b) assembler
(c) linker
(d) autoloader

**67.** In a three-phase half-wave diode rectifier, each diode conducts for the angle

(a) 60°
(b) 90°
(c) 120°
(d) 180°

**68.** The effect of source inductance on the performance of single-phase and three-phase full converter is to

(a) reduce the output voltage
(b) increase the load voltage
(c) reduce the ripples in the load current
(d) make discontinuous current as continuous

**69.** The output voltage frequency of a three-phase full converter with supply frequency 50 Hz is

(a) 50 Hz
(b) 150 Hz
(c) 200 Hz
(d) 300 Hz

**70.** The output voltage of a single-phase full converter during overlap period is equal to (neglecting voltage drop in the switching devices)

(a) zero
(b) source voltage
(c) voltage drop in source inductor
(d) peak of source voltage

**71.** The reduced form of the Boolean expression $A\overline{B}C + B + B\overline{D} + AB\overline{D} + \overline{A}C$ is

(a) $\overline{AB}$
(b) B+C
(c) B+D
(d) $\overline{B}+\overline{C}$

**72.** How many SCRs conduct simultaneously during the commutation process of the outgoing SCR in a three-phase full converter bridge?

(a) 2
(b) 3
(c) 4
(d) 6

**73.** Two full converters are connected back to back, operates in

(a) four quadrants
(b) three quadrants
(c) two quadrants
(d) one quadrant

**74.** What kind of communication is less sensitive to the environment?

(a) digital communication
(b) analog communication
(c) both (a) & (b)
(d) physical communication

**75.** If $V_m$ is the peak supply voltage in a single-phase mid-point rectifier, the SCRs are subjected to a peak inverse voltage of

(a) $V_m$ (b) $2V_m$

(c) $3V_m$ (d) $4V_m$

**76.** The process of converting the continuous signal into discrete signal is called

(a) sampling (b) modulation

(c) multiplexing (d) quantization

**77.** If $V_m$ is the peak supply voltage and á is the thyristor firing angle, the average output voltage of a full bridge rectifier is

(a) $\frac{V_m}{\pi}$ (b) $\frac{2V_m}{\pi}$

(c) $\frac{V_m}{\pi}(1+\cos\alpha)$ (d) $\frac{2V_m}{\pi}(1+\cos\alpha)$

**78.** In a phase controlled converter having RL load, the load current ripple amount depends upon

(a) R only (b) L only

(c) both R and L (d) neither R or L

**79.** The output voltage of a single-phase full-wave rectifier contains

(a) even harmonics (b) odd harmonics

(c) both even and odd harmonics (d) no harmonics

**80.** In which type of shift register data is fed in serially and data is shifted out in parallel form?

(a) serial-in, serial-out shift register (b) serial-in, parallel-out shift register

(c) parallel-in, serial-out shift register (d) parallel-in, parallel-out shift register

**81.** A step-up chopper has input voltage of 200 V and the duty cycle is 0.4, the average output voltage is

(a) 80 V (b) 120 V

(c) 333.33 V (d) 500 V

**82.** In which quadrant of output current-voltage plane a Type-C chopper operates in

(a) 1st quadrant (b) 2nd quadrant

(c) 3rd quadrant (d) both (a) & (b)

**83.** Which one is the voltage controlled semiconductor switching device?

(a) power BJT (b) power MOSFET

(c) GTO (d) IGBT

**84.** A copper can operates in

(a) constant frequency mode only (b) variable frequency mode only

(c) both (a) & (b) (d) neither (a) nor (b)

**85.** A chopper whose output current remains positive, whereas output voltage may be positive or negative is a

(a) Type-A chopper (b) Type-B chopper

(c) Type-C chopper (d) Type-D chopper

**86.** Which chopper is known as impulse commutated chopper?

(a) voltage commutated chopper (b) current commutated chopper

(c) load commutated chopper (d) multiphase chopper

87. A current source inverter circuit should
(a) have low source impedance
(b) have high source impedance
(c) get constant dc output
(d) be fed by a voltage source

88. Multiplexing the signals into time domain, it is called
(a) time division multiplexing
(b) frequency division multiplexing
(c) space division multiplexing
(d) code division multiplexing

89. In a three-phase 180° mode voltage source inverter, each thyristor conducts in one cycle for
(a) 60°
(b) 120°
(c) 180°
(d) 360°

90. How many thyristor switches conduct simultaneously in a three-phase 120° mode of voltage source inverter?
(a) 2
(b) 3
(c) 4
(d) 6

91. In a multiple pulse inverter used in PWM inverter have carrier signal frequency of 20 kHz and reference signal frequency 2 kHz, the number of pulses per half-cycle of the output signal is
(a) 2
(b) 3
(c) 4
(d) 5

92. Which semiconductor device can be used in current source inverter?
(a) SCR
(b) GTO
(c) power MOSFET
(d) power BJT

93. The output voltage of a single-phase bridge inverter, fed from a fixed dc source, is varied by
(a) varying the switching frequency
(b) pulse width modulation
(c) pulse amplitude modulation
(d) all of these

94. The anode current passing through a conducting SCR is 50 A. If its gate current is made half, what will be the anode current?
(a) 100 A
(b) 50 A
(c) 25 A
(d) zero

95. In a three-phase controlled bridge rectifier, frequency of ripple in the output voltage depends on
(a) source voltage magnitude
(b) power factor
(c) supply frequency
(d) firing angle

96. The armature current of a dc motor fed from a thyristor power converter consists of ripples. The ripple in the armature affects
(a) commutation of the motor
(b) speed of the motor
(c) torque of the motor
(d) efficiency of the motor

97. The chopper which can be used in motoring and regenerative braking mode is
(a) Tupe-A chopper
(b) Type-B chopper
(c) Type-C chopper
(d) Type-D chopper

98. Impulse noise is caused due to
(a) switching transients
(b) lightning strikes
(c) power line load switching
(d) all of these

**99.** The program counter of the 8085 is a

(a) 8-bit register
(b) 16-bit register
(c) 32-bit register
(d) 64-bit register

**100.** Which of the following device can be used as dual side wave shaping device

(a) Diode
(b) Triode
(c) Triac
(d) BJT

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