MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE (COMBINED) UNDER VARIOUS DEPARTMENT, GOVERNMENT OF MIZORAM, JULY-2024

ELECTRICAL ENGINEERING

PAPER-III

Time Allowed : 3 hours FM : 200

SECTION - A *(Multiple Choice questions) (100 Marks)*

All questions carry equal mark of 2 each. Attempt all questions.

*This Section should be answered only on the **OMR Response Sheet** provided.*

1. In 8-bit microprocessor, how many op codes are present?

(a) 246 (b) 278

(c) 250 (d) 256

2. What is the duty cycle of the output of an astable multivibrator?

(a) 50% (b) 100%

(c) 75% (d) 55%

3. A Zener diode utilizes _____ characteristic for voltage regulation.

(a) forward (b) reverse

(c) both forward & reverse (d) none of these

4. Which of the following is a property of RST 7.5 interrupt?

(a) It is a non-maskable interrupt (b) It has 3rd highest priority

(c) It uses level-triggered signal (d) Its vectored address is 003C H

5. Which of the following is a special-purpose register of microprocessor?

(a) Program counter (b) Instruction register

(c) Accumulator (d) Temporary register

6. If the data is transmitted only in one direction over a single communication channel, then it is of:

(a) simplex mode (b) duplex mode

(c) semi duplex mode (d) half duplex mode

7. In an ideal op-amp, which is not true?

(a) Open loop voltage gain is infinite (b) Input resistance is infinite

(c) Slew rate is infinite (d) CMRR is zero

8. When an input signal A=11001 is applied to a NOT gate serially, its output signal is:

(a) 111 (b) 110

(c) 10101 (d) 11001

9. For attenuation of high frequencies, we should use:

(a) shunt capacitance (b) series capacitance

(c) inductance (d) resistance

10. Which of the following oscillators is suitable for frequencies in the range of megahertz?

(a) RC phase shift (b) Wien bridge

(c) Hartley (d) Both (a) & (c)

11. Which is used to store critical pieces of data during subroutines and interrupts?

(a) Stack (b) Queue

(c) Accumulator (d) Data register

12. The load impedance Z_L of a CE amplifier has R and L_{in} series. The phase difference between output and input will be:

(a) 180° (b) 0

(c) more than 90° but less than 180° (d) more than 180° but less than 270°

13. An FM radio receiver which is tuned to a 91.6 MHz broadcast station may receive an image frequency of:

(a) 102.3 MHz (b) 113 MHz

(c) 70.2 MHz (d) 90.8 MHz

14. For telegraphy the most commonly used modulation system is

(a) FSK (b) two tone modulation

(c) PCM (d) single tone modulation

15. Which method bypasses the CPU for certain types of data transfer?

(a) Software interrupts (b) Interrupt-driven I/O

(c) Polled I/O (d) Direct memory access (DMA)

16. In a thyristor, holding current is:

(a) more than latching current (b) less than latching current

(c) equal to latching current (d) very small

17. Which of these sets of logic gates are known as universal gates?

(a) XOR, NAND, OR (b) OR, NOT, XOR

(c) NOR, NAND, XNOR (d) NOR, NAND

18. In the toggle mode, a JK flip-flop has:

(a) J = 0, K = 1 (b) J = 1, K = 1

(c) J = 0, K = 0 (d) J = 1, K = 0

19. As compared to power MOSFET, a BJT 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

20. The voltage in a single-phase half wave inverter varies between:

(a) Vs and 0 (b) Vs/2 and 0

(c) Vs/2 and –Vs/2 (d) Vs and –Vs

21. In Modulation, "carrier" is:

(a) speech voltage to be transmitted

(b) voltage with constant frequency, phase or amplitude

(c) resultant wave

(d) voltage for which frequency, phase or amplitude is varied

22. A buffer amplifier is:

(a) a double-tuned amplifier

(b) a high gain D.C. amplifier

(c) a cathode follower stage

(d) none of these

23. An amplitude modulated wave is modulated to 50%. What is the saving in power if carrier as well as one of the side bands are suppressed?

(a) 70%

(b) 65.4%

(c) 94.4%

(d) 25.5%

24. AM is used for broadcasting because:

(a) it is more noise immune than other modulation systems

(b) it requires less transmitting power compared with other systems

(c) its use avoids receiver complexity

(d) no other modulation system can provide the necessary bandwidth faithful transmission

25. What is the word length of an 8-bit microprocessor?

(a) 8-bits – 64 bits

(b) 4-bits – 32 bits

(c) 8-bits – 16 bits

(d) 8-bits – 32 bits

26. The di/dt rating of an SCR is specified for its:

(a) Decaying anode current

(b) Decaying gate current

(c) Rising gate current

(d) Rising anode current

27. A D-flip-flop is said to be transparent when:

(a) the output is LOW

(b) the output is HIGH

(c) the output follows clock

(d) the output follow input

28. 2's Complement of 10101011 is:

(a) 01010101

(b) 00111100

(c) 10101011

(d) 10101100

29. When will be the output of an AND gate is HIGH if there are three inputs, A, B, and C?

(a) A = 0, B = 0, C = 0

(b) A = 1, B = 1, C = 0

(c) A = 1, B = 0, C = 1

(d) A = 1, B = 1, C = 1

30. For a plate-modulated class C amplifier the plate supply voltage is E. The maximum plate cathode voltage could be almost high as:

(a) 3E

(b) 4E

(c) 2E

(d) 6E

31. It is found that a ship to ship communication suffers from fading. This can be avoided by using:

(a) Frequency diversity

(b) Directional antenna

(c) Space diversity

(d) Broad band antenna

32. Which of the following is an indirect way of generating FM?

(a) Varactor diode modulator

(b) Reactance FET modulator

(c) Armstrong modulator

(d) Reactance bipolar transistor

33. The early effect in a bipolar junction transistor is caused by:
    (a) fast turn-on
    (b) fast turn-off
    (c) large collector-base reverse bias
    (d) large emitter-base forward bias

34. How many Flip-Flops are required for mod–16 counter?
    (a) 5
    (b) 6
    (c) 3
    (d) 4

35. The output of a logic gate is 1 when all its inputs are at logic 0. The gate is either:
    (a) a NAND or an EX-OR
    (b) an OR or an EX-NOR
    (c) an AND or an EX-OR
    (d) a NOR or an EX-NOR

36. Which bus is bidirectional?
    (a) Address bus
    (b) Data bus
    (c) Control Bus
    (d) None of these

37. Op-Amp with positive feedback acts as:
    (a) Oscillator
    (b) Amplifier
    (c) Rectifier
    (d) Clipper

38. The binary numbers A = 1100 and B = 1001 are applied to the inputs of a comparator. What are the output levels?
    (a) a>b=1, a<b=0, a<b=1
    (b) a>b=0, a<b=1, a=b=0
    (c) a>b=1, a<b=0, a=b=0
    (d) a>b=0, a<b=1, a=b=1

39. A multiplexer is a combinational logic circuit used to perform the operation.
    (a) AND-AND
    (b) AND-OR
    (c) NOR-OR
    (d) XOR-NAND

40. In a single-phase full converter, for continuous conduction, each pair of SCRs conduct for:
    (a) $\pi - \alpha$
    (b) π
    (c) α
    (d) $\pi + \alpha$

41. In a 3-phase full converter, the output voltage pulsates at a frequency equal to:
    (a) supply frequency, f
    (b) $2f$
    (c) $3f$
    (d) $6f$

42. Suppose registers 'A' and 'B' contain 50H and 40H respectively. After instruction MOV A, B, what will be the contents of registers A and B?
    (a) 40H, 40H
    (b) 50H, 40H
    (c) 50H, 50H
    (d) 60H, 40H

43. For harmonic reduction by transformer connection, the output voltages from the two inverters must be:
    (a) similar and in-phase with each other
    (b) dissimilar but in-phase with each other
    (c) similar but phase shifted from each other
    (d) dissimilar and phase shifted from each other

44. Reverse recovery current in a diode depends upon:
    (a) Forward field current
    (b) Storage charge
    (c) Temperature
    (d) PIV

45. A SCR (Silicon Controlled Rectifier) is a:
    (a) device with 3 junctions
    (b) device with 2 junctions
    (c) device with 1 junction
    (d) device with 4 junctions

46. The load voltage of a chopper can be controlled by varying the:

(a) duty cycle (b) firing angle

(c) reactor position (d) extinction angle

47. MOSFET can be used as a:

(a) current controlled capacitor (b) voltage controlled capacitor

(c) current controlled inductor (d) voltage controlled inductors

48. The device that does not have the gate terminal is:

(a) TRIAC (b) DIAC

(c) FET (d) SCR

49. A single-phase full wave mid-point thyristor converter uses a 230/200 V transformer with center tap on the secondary side. The P.I.V per thyristor is:

(a) 100 V (b) 141.4 V

(c) 200 V (d) 282.8 V

50. How many entries will be in the truth table of a 4-input NAND gate?

(a) 6 (b) 8

(c) 32 (d) 16

SECTION - B *(Short answer type question) (100 Marks)*

All questions carry equal marks of ***5*** *each.*

This Section should be answered only on the ***Answer Sheet*** *provided.*

1. Content of accumulator of 8085 is 10110100 with the CY flag containing 1. Apply RAL twice and state the content of accumulator.

2. What is memory segmentation in 8086?

3. State internal RAM structure of 8051 microcontroller.

4. Using multiplexer simplify the following Boolean Function: $F(A,B,C) = \sum m(1,2,5,6,7)$.

5. State differences between Combinational and Sequential circuit.

6. Simplify the Boolean Expression : [(A+B)·(B+C)]'

7. Describe the working of class B chopper with diagram.

8. A 3 phase inverter is supplied from 580V source. For a star connected resistive load of 20 ohm per phase and 120 degree conduction mode, determine i) RMS value of phase voltage ii) RMS value of thyristor current.

9. With two transistor analogy explain how a small gate current can turn on a SCR.

10. What is DPSK? What is the bandwidth requirement of DPSK?

11. A carrier is frequency modulated with a sinusoidal signal of 2 kHz resulting in a maximum frequency deviation of 5 kHz. Find

(a) Modulation index

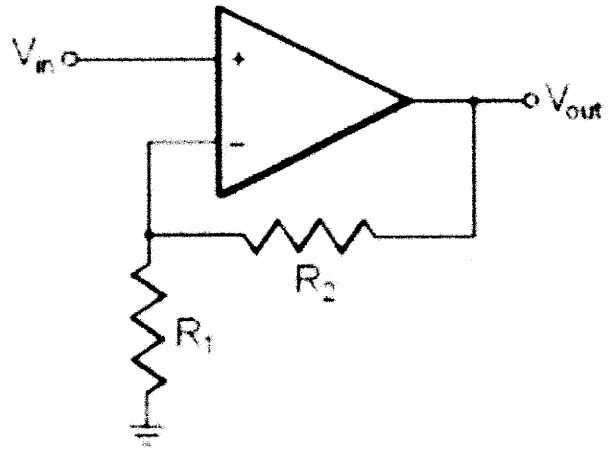
(b) Bandwidth of modulating signal.

12. Describe the switching characteristics of power BJT with relevant circuit diagram.

13. Explain the working of half wave controlled rectifier using neat circuit diagram.

14. Explain different flag register of 8085 microprocessor.

15. If Vin=2V, R_1 and R_2 are 5K Ω, find the output voltage and voltage gain for the given circuit.



16. Explain D flip-flop with the help of logic diagram, truth table and timing diagram.

17. What is modulation? Why is modulation necessary in communication system?

18. A step-up chopper has input voltage of 210 V and output voltage of 550 V. If the conduction time of switch is 100 μs, what is pulse width of output voltage? If the pulse width of output voltage become one fourth for constant frequency operation, compute the new average value of output voltage.

19. Why are multistage amplifiers used? What are its drawbacks? What is the significance of a load line in an amplifier?

20. Draw the circuit of a full adder and explain its operation briefly.

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