

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**

**ELECTRONICS & COMMUNICATION ENGINEERING
PAPER-III**

Time Allowed : 2 hours

Full Marks : 200

All questions carry equal mark of 2 each.

Attempt all questions.

1. Amplitude modulation is used for broadcasting because
 - (a) it is more noise immune to noise than other modulation systems
 - (b) it avoids receiver complexity
 - (c) compared with other systems it requires less transmitting power
 - (d) no other modulation system can provide the necessary bandwidth for high fidelity
2. Vestigial sideband modulation is normally used for
 - (a) HF point-to-point communications
 - (b) Monaural broadcasting
 - (c) TV broadcasting
 - (d) Stereo broadcasting
3. Statement (I): Coaxial cable is not preferred at microwave frequencies.
Statement (II): At microwave frequencies, coaxial cable has high attenuation.
 - (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
 - (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
 - (c) Statement (I) is true but Statement (II) is false
 - (d) Statement (I) is false but Statement (II) is true
4. Antennas that consist of a regular arrangement of antenna elements with a feed network is
 - (a) aperture antennas
 - (b) array antennas
 - (c) printed antennas
 - (d) wire antennas
5. In a microprocessor when a CPU is interrupted, it
 - (a) Stops execution of instructions
 - (b) Acknowledges interrupt and branches of subroutine
 - (c) Acknowledges interrupt and continues
 - (d) Acknowledges interrupt and waits for the next instruction from the interrupting device
6. What happens when the radiation resistance of the antenna matches the characteristic impedance of the transmission line?
 - (a) no transmission occurs
 - (b) no reception occurs
 - (c) SWR is maximum
 - (d) SWR is minimum

7. An increase in the modulation index leads to increase in bandwidth in case of
 - (a) AM
 - (b) FM
 - (c) PM
 - (d) None of these
8. Which of the following gives maximum probability of error?
 - (a) ASK
 - (b) FSK
 - (c) PSK
 - (d) DPSK
9. Which one of the following is not a vectored interrupt?
 - (a) TRAP
 - (b) INTR
 - (c) RST 7.5
 - (d) RST 3
10. Lens antennas are classified into two types. One being fast antenna, the other one is:
 - (a) slow antenna
 - (b) delay antenna
 - (c) dynamic antenna
 - (d) none of the mentioned
11. The disadvantage of coherent FSK detection is that
 - (a) It leads to high signal fading
 - (b) It requires two synchronized oscillations
 - (c) Both (a) & (b)
 - (d) None of these
12. If the progressive shift in antenna array is equal to zero then it is called
 - (a) broad side
 - (b) end-fire
 - (c) yagi-uda
 - (d) fishbone antenna
13. In a microprocessor with 16 address and 12 data lines, the maximum number of opcodes is
 - (a) 2^6
 - (b) 2^8
 - (c) 2^{12}
 - (d) 2^{16}
14. The duration of one T-state in the 8085 microprocessor that uses a crystal of 5.00 MHz is
 - (a) $0.2 \mu s$
 - (b) $0.4 \mu s$
 - (c) $2.5 \mu s$
 - (d) $5.0 \mu s$
15. What is the purpose of source coding in data compression?
 - (a) To encode data for transmission
 - (b) To reduce the redundancy in the source data
 - (c) To modulate carrier signals
 - (d) To improve signal-to-noise ratio
16. A major disadvantage of klystron amplifier is:
 - (a) low power gain
 - (b) low bandwidth
 - (c) high source power
 - (d) design complexity
17. In a microprocessor, the service routine for a certain interrupt starts from a Fixed location of memory which cannot be externally set, but the interrupt can be delayed or rejected. Such an interrupt is
 - (a) Non-maskable and non-vectored
 - (b) Maskable and non-vectored
 - (c) Non-maskable and vectored
 - (d) Maskable and vectored
18. In an 8085 microprocessor, the instruction CMP B has been executed while the content of the accumulator is less than that of register B. As a result,
 - (a) carry flag will be set but zero flag will be reset
 - (b) carry flag will be reset but zero flag will be set
 - (c) both carry flag and zero flag will be reset
 - (d) both carry flag and zero flag will be set

19. Which of the following is a typical example of Time Division Multiplexing (TDM) application?
 - (a) AM radio broadcasting
 - (b) Cable television (CATV)
 - (c) Satellite communication
 - (d) DSL Internet access
20. What is the primary advantage of using single-mode optical fibre in long-distance communication?
 - (a) High data rate
 - (b) Low dispersion
 - (c) Low cost
 - (d) Robustness to bending
21. What is the binary representation of the decimal number 13?
 - (a) 1101
 - (b) 1010
 - (c) 1111
 - (d) 1001
22. Coupler that is mostly used in balanced amplifiers to achieve the required performance is:
 - (a) Branch line coupler
 - (b) Wilkinson coupler
 - (c) Lange coupler
 - (d) Waveguide coupler
23. In VHF radio communication, what is the primary factor that limits the range of transmission?
 - (a) Atmospheric scattering
 - (b) Ducting
 - (c) Line-of-sight requirements
 - (d) Ground-wave propagation
24. Which frequency range is typically associated with Ultra High-Frequency (UHF) radio waves?
 - (a) 30 kHz - 300 kHz
 - (b) 300 MHz - 3 GHz
 - (c) 3 GHz - 30 GHz
 - (d) 300 GHz - 3 THz
25. A _____ is a connection that sends energy from one location to another.
 - (a) Transmission line
 - (b) Cable lines
 - (c) Fibre cable lines
 - (d) Modem line
26. As a conductor's temperature increases, its resistance changes _____.
 - (a) Inversely
 - (b) Exponentially
 - (c) Non-linearly
 - (d) Linearly
27. An impedance mismatch of the transmission line causes signal reflection, resulting in _____.
 - (a) Insertion loss
 - (b) Reflection loss
 - (c) Transmission loss
 - (d) Return loss
28. What is the purpose of the ALU (Arithmetic Logic Unit) in a CPU?
 - (a) To store program instructions
 - (b) To perform arithmetic and logic operations
 - (c) To manage memory access
 - (d) To control input/output devices
29. Which number system uses the digits 0-9 and the base 16, making it commonly used in computer programming for representing binary data?
 - (a) Binary
 - (b) Octal
 - (c) Decimal
 - (d) Hexadecimal
30. A dipole antenna is also called as
 - (a) Marconi antenna
 - (b) Yagi antenna
 - (c) Bidirectional antenna
 - (d) Hertz antenna
31. In AM, if the modulation index is more than 100%, then
 - (a) Power of the wave increases
 - (b) The wave gets distorted
 - (c) Efficiency of transmission increases
 - (d) It remains the same

32. With an increase in operating frequency, the background noise temperature:
- (a) increases
 - (b) decreases
 - (c) remains constant
 - (d) remains unaffected
33. What is the primary function of a microwave isolator in a microwave circuit?
- (a) To combine signals of different frequencies
 - (b) To amplify microwave signals
 - (c) To prevent signal reflections
 - (d) To generate microwave signals
34. In the Intel 8085 microprocessor, which register is used as a temporary register for various arithmetic and logic operations?
- (a) Stack Pointer (SP)
 - (b) Program Counter (PC)
 - (c) Accumulator (A)
 - (d) Flag Register (F)
35. All to the following are non-volatile memories EXCEPT
- (a) ROMs
 - (b) Semiconductor RAM
 - (c) PROM
 - (d) EPROMs
36. In microwave antenna design, what is the primary factor that determines the directivity of an antenna?
- (a) Beamwidth
 - (b) Gain
 - (c) Polarization
 - (d) Frequency
37. A ROM is to be used to implement a "squarer", which outputs the square of a 4-bit number. What must be the size of the ROM?
- (a) 8 address lines and 16 data lines
 - (b) 4 address lines and 8 data lines
 - (c) 8 address lines and 8 data lines
 - (d) 4 address lines and 16 data lines
38. In phase-shift SSB modulator, the input signals to one of the balanced modulators are phase-shifted by
- (a) 30°
 - (b) 45°
 - (c) 90°
 - (d) 180°
39. The difference between the phase and frequency modulation
- (a) is purely theoretical because they are the same in practice
 - (b) is too great to make the two systems compatible
 - (c) lies in the poorer audio response of phase modulation
 - (d) lies in the different definitions of the modulation index
40. A single ROM is used to design a combinational circuit described by a truth table. What is the number of address lines in the ROM?
- (a) Number of input variables in the truth table
 - (b) Number of output variables in the truth table
 - (c) Number of input plus output variables in the truth-table
 - (d) Number of lines in the truth-table
41. The vectored address corresponding to the software interrupt RST 7 in 8085 is
- (a) 0017 H
 - (b) 0027H
 - (c) 0038 H
 - (d) 0700 H
42. _____ is the best medium for handling the large microwave power.
- (a) Coaxial line
 - (b) Rectangular wave guide
 - (c) Strip line
 - (d) Circular wave guide

43. Which TM mode and TE mode in rectangular waveguide and circular wave guide respectively has lowest cut off frequency?
- (a) TM_{11} and TE_{11} (b) TM_{01} and TE_{01}
(c) TM_{10} and TE_{20} (d) TM_{21} and TE_{21}
44. The following is NOT an advantage of FM over AM.
- (a) noise immunity (b) fidelity
(c) capture effect (d) sputtering effect
45. Consider the following statements:
Assertion (A): Microstrip is very commonly used in microwave integrated circuits.
Reason (R): Microstrip has an easy access to the top-surface so that active and passive discrete components can be easily mounted.
- (a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct but R is not correct explanation of A
(c) A is correct but R is wrong
(d) A is wrong but R is correct
46. Consider a system consisting of a microprocessor, memory, and peripheral devices connected by a common bus. During DMA data transfer, the microprocessor
- (a) only reads from the bus (b) only writes to the bus
(c) both reads from and writes to the bus (d) neither reads from nor writes to the bus
47. In a single-tone FM discriminator (S_o / N_o) is
- (a) proportional to deviation (b) proportional to cube of deviation
(c) inversely proportional to deviation (d) proportional to square of deviation
48. Out of modes TE_{20} and TE_{30} of propagation of electromagnetic energy:
- (a) Both have the same cut off frequency
(b) TE_{20} has lower cut off frequency as compared to TE_{30}
(c) TE_{30} has lower cut off frequency as compared to TE_{20}
(d) None of the above
49. FM broadcast band lies in
- (a) VHF band (b) UHF band
(c) SHF band (d) None of these
50. A magic-Tee is nothing but a _____.
- (a) Modification of E-plane tee (b) Modification of H-plane tee
(c) Combination of E-plane and H-plane (d) Two E-plane tees connected in parallel
51. Microprocessor 8085 regains control of the bus
- (a) immediately after HOLD goes low (b) immediately after HOLD goes high
(c) after half-clock cycle after HLDA goes low (d) after half-clock cycle after HLDA goes high
52. The contents of Register (B) and Accumulator (A) of 8085 microprocessor are 49H and 3AH respectively. The contents of A and the status of carry flag (CY) and sign flag (S) after executing SUB B instruction are
- (a) $A=F1, CY=1, S=1$ (b) $A=0F, CY=1, S=1$
(c) $A=FO, CY=0, S=0$ (d) $A=1F, CY=1, S=1$

53. The following sequence of instructions are executed by an 8085 microprocessor:

1000: LXI SP, 27FF

1003: CALL 1006

1006: POP H

The contents of the stack pointer (SP) and the HL register pair on completion or execution of these instructions are:

(a) SP = 27FF, HL = 1003

(b) SP = 27FD, HL = 1003

(c) SP = 27FF, HL = 1006

(d) SP = 27FD, HL = 1006

54. An ideal directional coupler has _____ directivity, and _____ insertion loss.

(a) infinity, zero

(b) zero, zero

(c) zero, infinity

(d) infinity, infinity

55. Which system is free from noise?

(a) FM

(b) AM

(c) Both FM & AM

(d) None of these

56. In FM broadcast, the maximum modulation frequency is restricted to

(a) 5 kHz

(b) 10 kHz

(c) 15 kHz

(d) 20 kHz

57. The main advantage of superheterodyne receiver is

(a) simple circuit

(b) better tracking

(c) improvement in selectivity and sensitivity

(d) better alignment

58. Which of the following elements are taken in Microwave circuits?

(a) Lumped Circuit Elements

(b) Distributed Circuit Elements

(c) Both (a) & (b)

(d) None of these

59. In a directional coupler:

(a) isolation (dB) equals coupling plus directivity

(b) coupling (dB) equals isolation plus directivity

(c) directivity (dB) equals isolation plus coupling

(d) isolation (dB) equals (coupling) (directivity)

60. Three devices A, B and C have to be connected to an 8085 microprocessor. Device A has highest priority and device C has the lowest priority. In this context which of the following is correct assignment of interrupt inputs?

(a) A uses TRAP, B uses RST 5.5 and C uses RST 6.5

(b) A uses RST 7.5, B uses RST 6.5 and C uses RST 5.5

(c) A uses RST 5.5, B uses RST 6.5 and C uses RST 7.5

(d) A uses RST 5.5, B uses RST 6.5 and C uses TRAP

61. If the number of bits in input and output codes is 4 and 8 respectively for a ROM. Then the memory of this chip is equal to

(a) 12 bits

(b) 32 bits

(c) 128 bits

(d) 256 bits

62. The solid area through which all the power radiated by the antenna is:

(a) beam area

(b) effective area

(c) aperture area

(d) beam efficiency

63. One of the reasons why vacuum tubes eventually fail at microwave frequencies is that their
- (a) Series inductive reactance become too small
 - (b) Noise figure increases
 - (c) Shunt capacitive reactance become too large
 - (c) Transit time becomes too short
64. What is the decimal equivalent of the binary number 1101.0111?
- (a) 13.4375
 - (b) 14.875
 - (c) 11.011
 - (d) 12.75
65. In a TV system, the modulation methods employed for video and audio signals are
- (a) both amplitude modulation
 - (b) both frequency modulation
 - (c) respectively amplitude modulation and frequency modulation
 - (d) respectively frequency modulation and amplitude modulation
66. In multicavity klystron additional cavities are inserted between buncher and catcher cavities to achieve
- (a) higher gain
 - (b) higher efficiency
 - (c) higher frequency
 - (d) higher bandwidth
67. The resonant frequency of an RF amplifier is 1 MHz and its bandwidth is 10 KHz. The Q-factor will be
- (a) 0.01
 - (b) 0.1
 - (c) 10
 - (d) 100
68. Which instruction in the Intel 8086 microprocessor is used to transfer control to a subroutine and save the return address in the stack?
- (a) CALL
 - (b) JMP
 - (c) RET
 - (d) PUSH
69. The cavity magnetron uses strapping to
- (a) Prevent mode jumping
 - (b) Ensure bunching
 - (c) Prevent cathode back-heating
 - (d) Improve the phase-focusing effect
70. In a DM system, the granular noise occurs when modulating signal
- (a) increases rapidly
 - (b) decreases rapidly
 - (c) changes within the step size
 - (d) has high frequency component
71. What is the maximum addressable memory capacity of the Intel 8085 microprocessor?
- (a) 64 KB
 - (b) 1 MB
 - (c) 16 MB
 - (d) 4 GB
72. The time period of a square wave in the audio frequency range is measured using an 8085 microprocessor by feeding the square wave to one of the four interrupts, namely, RST 7.5, RST 6.5, RST 5.5 or INTR. The algorithm used starts a timer at the beginning of a time period, stops the timer at the beginning of the next time period and reads the timer values for time measurement. Which of the following interrupts should be selected for this application?
- (a) INTR
 - (b) RST 5.5
 - (c) RTS 6.5
 - (d) RST 7.5

73. The following 8085 instructions are executed sequentially.

XRAA
MOV L, A
MOV H, L
INX H
DAD H

After execution, the content of HL register pair is

- (a) 0000H (b) 0001H
(c) 0101H (d) 0002H
74. To avoid difficulties with strapping at high frequencies, the type of cavity structure used in the magnetron is the
- (a) Hole-and-slot (b) Slot
(c) Vane (d) Rising sun
75. The PAM signal can be detected by
- (a) bandpass filter (b) bandstop filter
(c) low pass filter (d) high pass filter
76. In communications, the sampling technique leads to
- (a) Better efficiency (b) Highest speed of communication
(c) Less costly equipment (d) None of the above
77. The primary purpose of the helix in a traveling-wave tube is to
- (a) Prevent the electron beam from spreading in the long tube
(b) Reduce the axial velocity of the RF field
(c) Ensure broadband operation
(d) Reduce the noise figure
78. A magnetron whose oscillating frequency is electronically adjustable over a wide range is called _____.
- (a) Coaxial magnetron (b) Dither-tuned magnetron
(c) Frequency-agile magnetron (d) VTM
79. Which data structure is most suitable for maintaining a collection of unique elements with no specific order requirement?
- (a) Stack (b) Queue
(c) Set (d) Binary tree
80. Space loss occurs due to a decrease in
- (a) electric field strength (b) efficiency
(c) phase (d) signal power
81. A backward-wave oscillator is based on the
- (a) Rising-sun magnetron (b) Crossed-field amplifier
(c) Coaxial magnetron (d) Traveling-wave tube
82. The main advantage of PCM is
- (a) less bandwidth (b) less power
(c) better S/N ratio (d) possibility of multiplexing

83. In ASK, the transmission bandwidth is equal to
(a) Baseband bandwidth (b) Twice baseband bandwidth
(c) Four times baseband bandwidth (d) None of the mentioned
84. Which of the following storage devices is typically used for long-term data storage in a personal computer?
(a) RAM (Random Access Memory) (b) SSD (Solid State Drive)
(c) CPU (Central Processing Unit) (d) Optical Drive
85. Semiconductor diode used in switching circuits at Microwave range is
(a) PIN diode (b) Varactor diode
(c) Tunnel diode (d) Gunn diode
86. A uniformly spaced linear array of identical radiators having uniform amplitude of excitation and linear phase variation with non-zero gradient will produce
(a) Pencil beam at broadside (b) Fan beam
(c) Scanned cosecant beam (d) Scanned Pencil beam
87. A PLA can be used
(a) as a microprocessor (b) as a dynamic memory
(c) to realize a sequential logic (d) to realize a combinational logic
88. Consider the following statements:
1. Dissipative attenuator has a fixed value of attenuation.
2. Reflective attenuator has a fixed value of attenuation.
3. Both dissipative and reflective attenuators are available only with fixed attenuation.
4. Both dissipative and reflective attenuators are available with either fixed or variable attenuation.
Which of the above is/are correct?
(a) 1 only (b) 1 and 2
(c) 1, 2 and 3 (d) 4 only
89. The primary reason behind identically zero magnetic field outside a coaxial cable is:
(a) maximization of magnetic lines of force
(b) the work done along a closed path is equal to total current flow
(c) the force between magnetic elements
(d) the magnetic polarization
90. Which of the following is a widely used error-correcting code in digital communication?
(a) Gray code (b) Morse code
(c) Hamming code (d) Baudot code
91. Which type of multiplexing is commonly used in telephone networks for carrying voice conversations?
(a) Frequency Division Multiplexing (b) Code Division Multiplexing
(c) Time Division Multiplexing (d) Amplitude Modulation
92. Which of the following is a common method for measuring the resonant frequency of a microwave cavity?
(a) VSWR measurement (b) Smith chart analysis
(c) Cavity perturbation method (d) Noise figure measurement

93. Which parameter is commonly used to characterize the performance of microwave components and transmission lines in terms of signal loss?
- (a) VSWR (b) Q-factor
(c) S-parameter (d) Phase velocity
94. What is the main advantage of Frequency Division Multiplexing (FDM) over Time Division Multiplexing (TDM)?
- (a) Higher data rates for each signal (b) Simplicity of implementation
(c) Lower susceptibility to interference (d) Efficient use of time slots
95. In a microprocessor, the register which holds the address of the next instruction to be fetched is
- (a) Accumulator (b) Program Counter
(c) Stack Pointer (d) Instruction Register
96. What is the primary function of a microwave duplexer in a communication system?
- (a) To transmit and receive signals on the same antenna
(b) To generate microwave signals
(c) To attenuate microwave signals
(d) To shift the phase of microwave signals
97. In free-space optical communication, what can cause signal attenuation?
- (a) Fiber splicing
(b) Scattering by dust and particles in the atmosphere
(c) Laser diode modulation
(d) Coupling losses
98. Which frequency band is commonly used for satellite communication links in the Ku-band?
- (a) HF (b) VHF
(c) UHF (d) Microwave
99. Which component of a satellite communication system is responsible for converting uplink signals to downlink signals and vice versa?
- (a) Satellite transponder (b) Satellite modem
(c) Satellite dish (d) Satellite receiver
100. Which type of microwave amplifier is known for its low noise figure and is often used in low-noise receivers?
- (a) Gunn diode amplifier (b) BJT amplifier
(c) Parametric amplifier (d) Maser

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