

MIZORAM PUBLIC SERVICE COMMISSION
TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO
JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE
UNDER POWER & ELECTRICITY DEPARTMENT, NOVEMBER, 2015

ELECTRONICS & COMMUNICATION ENGINEERING
PAPER - III

Time Allowed : 3 hours

Full Marks : 200

Attempt all questions.

Part A - Objective Type Questions (100 Marks)

All questions carry equal marks of 2 each.

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

1. The positive peak of an AM wave is 16V and the minimum value is 4V. Assuming single tone modulation, the modulation index is
(a) 0.6 (b) 0.25
(c) 4 (d) 0.36
2. In single tone AM modulation, the transmission efficiency for $m=1$ is
(a) 33.3% (b) 50%
(c) 100% (d) 16.65%
3. Satellite communication uses
(a) 3 to 6 GHz (b) 3 to 10 MHz
(c) 10 to 50 GHz (d) 100 to 200 GHz
4. The rate at which information can be carried through a communication channel depends on
(a) carrier frequency (b) bandwidth
(c) transmission loss (d) transmitted power
5. A 400 W carrier is modulated to a depth of 75 percent. The total power in modulated wave will be
(a) 38.5 W (b) 400 W
(c) 512.5 W (d) 615.5 W
6. In a PCM system, if we increase the quantization levels from 2 to 8, how do the relative bandwidth requirements vary?
(a) Get doubled (b) Get tripled
(c) Remain same (d) Become eight times
7. Which of the following parameters is negligible in transmission lines?
(a) R (b) L
(c) C (d) G
8. The beam of a radar should be
(a) Very narrow (b) Very wide
(c) Neither too narrow nor too wide (d) Either (b) or (c)

9. A rectangular waveguide has width a .
Then the cutoff frequency (with corresponding wavelength λ_c)
- (a) $a = \lambda_c / 2$ (b) $a = \lambda_c$
(c) $a = \lambda_c / 4$ (d) $a = 2 \lambda_c$
10. A duplexer is used to
- (a) Couple two antennas to a transmitter
(b) Isolate the antenna from the local oscillator
(c) Prevent interference between two antennas connected to receiver
(d) Use an antenna for reception or transmission without interference
11. A waveguide section in a microwave circuit acts as
- (a) LP filter (b) Bandpass filter
(c) HP filter (d) Bandstop filter
12. Impedance inversion may be obtained with
- (a) A short circuited stub (b) A quarter wave line
(c) An open circuited stub (d) A half wave line
13. Which of the following is not a negative resistance device?
- (a) Gunn diode (b) Tunnel diode
(c) Impatt diode (d) Varactor diode
14. In a klystron amplifier the force on all electrons
- (a) Causes acceleration of all electrons
(b) Causes retardation of all electrons
(c) Causes acceleration of some electrons and retardation of others
(d) None of the above
15. If word length is 16 bits the decimal equivalent of largest number which can be stored is
- (a) 32767 (b) 32766
(c) 16383 (d) 16384
16. The decimal equivalent of binary 1101.11 is
- (a) 9.75 (b) 13.75
(c) 11.50 (d) 11.75
17. The maximum number of characters for variable names in C is
- (a) 4 (b) 8
(c) 12 (d) 16
18. For accurate clock period in 8085 it is preferable to use
- (a) Crystal (b) Crystal of LC resonant circuit
(c) Crystal of RC circuit (d) LC or RC circuit
19. In 8085 stack pointer is
- (a) 4 bit register (b) 8 bit register
(c) 16 bit register (d) 32 bit register
20. 8255 is a
- (a) Programmable peripheral interface (b) I/O device
(c) Memory chip (d) None of these

21. The number of pins in microprocessor 8086 is
(a) 30 (b) 40
(c) 50 (d) 60
22. For AM receivers the standard IF frequency is
(a) 106 KHz (b) 455 KHz
(c) 1.07 MHz (d) 10.7 MHz
23. If a line is terminated in characteristic impedance Z_0 ; the input impedance measured at the input will be
(a) Z_0 (b) $Z_0/2$
(c) zero (d) infinite
24. Which of the following is analog in nature?
(a) PCM (b) PWM
(c) delta modulation (d) differential PCM
25. Which of the following is taken as reference antenna for directive gain?
(a) $\frac{1}{2}$ wave dipole (b) elementary doublet
(c) isotropic antenna (d) infinitesimal dipole
26. To separate channels in FDM receivers we have to use
(a) integration (b) AND gate
(c) band pass filter (d) differentiation
27. The characteristic impedance of a cable is about
(a) 2 (b) 5
(c) 50 (d) 300
28. Most electromagnetic transmission in rectangular waveguide uses
(a) TE_{10} mode (b) TE_{01} mode
(c) TE_{20} mode (d) TE_{11} mode
29. What is the numerical aperture in an optical fiber when critical angle is 30° ?
(a) 0.5 (b) 0.707
(c) 0.866 (d) 0.2
30. In a Klystron amplifier the input cavity is called
(a) buncher (b) catcher
(c) pierce gun (d) collector
31. Which of the following computer memories is fastest?
(a) cache (b) primary
(c) mass storage (d) backup memories
32. The number of interrupt lines in 8085 microprocessor is
(a) 3 (b) 4
(c) 5 (d) 7
33. The data structure needed to convert infix notation to prefix notation is
(a) queue (b) stack
(c) tree (d) graph

34. Quantizing noise occurs in
(a) TDM (b) FDM
(c) PWM (d) PCM
35. Which signaling scheme is most affected by noise?
(a) ASK (b) FSK
(c) PSK (d) QAM
36. A matched load is one in which
(a) reflection is zero (b) reflection is unity
(c) partial reflection (d) none of these
37. Which principle of operation of cavity wave meters is used in microwave networks?
(a) phase shift (b) resonance
(c) polarisation shift (d) gyration
38. A sinusoidal voltage of 2 kV peak value is amplitude modulated to give 20% modulation. The peak value of each side band term is
(a) 800V (b) 400V
(c) 200V (d) 100V
39. In the FM wave described by equation $v = 15 \sin (4 \times 10^8 t + 3 \sin 1100 t)$, the maximum frequency deviation is
(a) 175 Hz (b) 525 Hz
(c) 58.33 Hz (d) 3 Hz
40. Narrowband FM signal can be considered to be equal to
(a) PM (b) AM
(c) SSB (d) DSB
41. The bandwidth of DSB suppressed carrier modulation system when the modulating frequency varies between 500 Hz and 5 kHz is
(a) 555 kHz (b) 505 kHz
(c) 500 kHz (d) 9 kHz
42. The velocity of sound waves in air
(a) is constant at all temperatures
(b) varies directly as temperature
(c) varies inversely as absolute temperature
(d) varies directly as square root of absolute temperature
43. Troposphere is the portion of atmosphere
(a) nearest to ground (b) between 50 to 90 km above ground
(c) between 110 to 220 km above ground (d) between 250 to 350 km above ground
44. Light may be propagated along a fiber-optic cable in which of the following modes?
(a) multimode step index (b) single-mode step index
(c) multimode graded index (d) all of these
45. A television (TV) transmission is an example of which type of transmission?
(a) Simplex (b) Half duplex
(c) Full duplex (d) None of these

46. INTELSAT stands for
(a) International Telecommunications Satellite (b) India Telecommunications Satellite
(c) Inter Telecommunications Satellite (d) None of these
47. Kepler's first law states
(a) The path followed by a satellite around the primary will be an ellipse.
(b) The path followed by a satellite around the primary will be a circle.
(c) The path followed by a satellite around the primary will be a sphere
(d) None of the above
48. An instruction used to set the carry flag in a computer can be classified as
(a) Data transfer (b) Arithmetic
(c) Logical (d) Program control
49. In the 8085 microprocessor the RST6 instruction transfers the program execution to the following locations
(a) 30H (b) 24H
(c) 48H (d) 60H
50. The highest priority of interrupt in 8085 microprocessor system is
(a) RST 7.5 (b) RST 6.5
(c) INTR (d) TRAP

Part B - Short Answer Questions (100 Marks)

All questions carry equal marks of 5 each.

*This Part should be answered only on the **Answer Booklet** provided.*

1. What do you mean by modulation? Why do we need to modulate a signal?
2. Why is refractive index of the core more than the cladding in optical fibers?
3. What are TE and TM modes? Why is TE_{10} called the dominant mode in rectangular waveguide?
4. What is a Magic Tee? Obtain its Scattering matrix.
5. Explain the phenomenon of differential negative resistance in Gunn diode.
6. Write a C program to check whether a number is prime or not.
7. Describe the flag registers in 8085 microprocessor.
8. What is quantization of signals? How can the quantization error be reduced?
9. What is the need for altitude control for a satellite? Name two altitude control components in satellite communication.
10. (a) An 800Hz, 3V modulating signal in an FM system produces a deviation of 6KHz. If the modulating voltage is increased to 6V, what is the new deviation? (3)
(b) Find modulation indexes in each case (2)
11. Define antenna beam width and bandwidth. Differentiate clearly between the two.
12. (a) Discuss about Harvard and Von Neumann architecture (3)
(b) Compare RISC and CISC (2)

13. How are instruction set of 8085 classified? Explain with example.
14. Using suitable diagram, explain the working principle of envelope detector for demodulating AM signal.
15. Give the principle of super-hydrodyne receiver.
16. An audio signal of FM radio station is sampled at a rate of 15% above the Nyquist rate. Signal is sampled in 512 levels and bandwidth of the signal is 4 KHz. What will be the minimum bandwidth required to transmit this signal?
17. Define VSWR in a transmission line.
18. Show that TEM waves cannot propagate through a hollow waveguide.
19. What is difference between Microprocessor and Microcontroller?
20. Write an assembly level language program to find the sum of two 16-bit numbers using an 8085 microprocessor.

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