MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF GRADE-V OF MIZORAM ENGINEERING SERVICE (AE/SDO) UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM JANUARY, 2012

ELECTRICAL ENGINEERING

PAPER – III

Time Allowed : 3 hours Full Marks : 150

All questions carry equal marks of 1 each.
Attempt all questions.

1. When a reverse biased is applied to a *p-n* junction, the width of the depletion layer
(a) remains the same (b) is increased
(c) is decreased (d) may increase or decrease

2. Ripple frequency of the output waveform of a bridge rectifier when fed with a 50Hz sine wave is
(a) 100Hz (b) 25Hz
(c) 50Hz (d) 200Hz

3. The primary function of a filter is to
(a) minimize a.c. input variations
(b) suppress odd harmonics in the rectifier output
(c) stabilize d.c. level of the output voltage
(d) remove ripples from the rectified output

4. The potential barrier existing across a PN junction
(a) facilitates recombination of electrons and holes
(b) prevents flow of minority carriers
(c) prevents total recombination of holes and minority carriers
(d) prevents neutralization of acceptor and donor ions

5. The amplifier circuit suitable for impedance matching is
(a) common base (b) common collector
(c) common emitter (d) all of these

6. The value of Zener current is
(a) limited by external circuit resistance (b) determined by Zener voltage
(c) totally independent of temperature (d) always in μA range

7. When used in a circuit, the Zener diode is always
(a) forwarded biased (b) connected in series
(c) troubled by overheating (d) reverse biased.

8. The main reason why electrons can tunnel through a P-N junction is that
(a) they have high energy (b) barrier potential is very low
(c) depletion layer is extremely thin (d) impurity level is low

9. Satellites used for intercontinental communications are known as
(a) Intelsat (b) Domsat
(c) Comsat (d) Marisat

10. A semiconductor device that has only high energy electrons as carriers is called a
(a) Schottky diode (b) IMPATT diode
(c) PIN diode (d) varactor diode

11. In a single-stage CB amplifier, a smaller load resistance R_L will produce
(a) high current gain (b) high voltage gain
(c) better frequency response (d) higher power gain

12. RC coupling is popular in low-level audio amplifiers because it
(a) has better low frequency response
(b) is expensive and needs no adjustments
(c) provides an output signal in phase with the input signal
(d) needs low voltage battery for collector supply

13. The main factor which makes a MOSFET likely to break down during normal handling is its
(a) very low gate capacitance (b) high leakage current
(c) high input resistance (d) both (a) and (c)

14. The extremely high input impedance of a MOSFET is primarily due to the
(a) absence of its channel
(b) negative gate-source voltage
(c) depletion of current carriers
(d) extremely small leakage current of its gate capacitor

15. Which stage of a D.C. power supply uses a Zener as the main component?
(a) rectifier (b) voltage divider
(c) regulator (d) filter

16. An ideal OP-AMP has
(a) infinite open-loop gain (b) infinite input resistance
(c) Zero output resistance (d) all of these

17. OP-AMPs have become very popular in industry mainly because
(a) they are very cheap
(b) their external characteristics can be changed to suit any application
(c) of their extremely small size
(d) they are available in different packages

145. Out of the following three memories, which are of the combinational logic type?
1. Read only memory 2. Random access memory 3. Shift register memory
(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

146. In a certain telemetry system, the measured values are converted to digital form. The digital values can then be transmitted via FSK (binary or quaternary) or BPSK or QPSK systems. Out of these the best noise immunity can be obtained with
(a) binary FSK (b) quaternary FSK
(c) BPSK (d) QPSK

147. Modems are used for
(a) modulating digital signals (b) converting analog to digitals and vice versa
(c) either of these (d) none of these

148. The noise figure of an amplifier is 6dB. If the input S/N ratio is 38 dB, then the output S/N ratio is
(a) 44 dB (b) 40 dB
(c) 36 dB (d) 32 dB

149. For intelligible voice communication, minimum bandwidth required is
(a) 900 Hz (b) 1 KHz
(c) 3 KHz (d) 6 KHz

150. In a modulation system, if modulating frequency is doubled, the modulation index also becomes double. The system is
(a) FM (b) AM
(c) PM (d) PCM

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134. Which of the following semiconductor power device is not a current triggered device?
(a) Thyristor (b) G.T.O.
(c) Triac (d) MOSFET

135. The on-state voltage of a Gate Turn Off (GTO) thyristor is
(a) 0.7 V (b) 1.2 V
(c) 2.3 V (d) > 3V

136. In a gate turn off thyristor, anode current begins to fall when gate current
(a) is negative peak at time t=0
(b) is negative peak at t=storage time + fall time
(c) is negative peak at t= storage time
(d) none of these

137. Which of the following systems is preferred for chopper drives?
(a) Constant frequency system (b) Variable frequency system
(c) constant voltage system (d) none of these

138. In d.c. choppers, the waveforms for input and output voltages are respectively
(a) discontinuous and continuous (b) both continuous
(d) both discontinuous (d) continuous and discontinuous

139. A thyristor chopper is preferred over other choppers because it
(a) provides static switching (b) is economical
(c) can be manufactured easily (d) none of these

140. A step-up chopper has V as the source voltage and δ as the duty cycle. The output voltage for this chopper is given by
(a) $V(1 + \delta)$ (b) $V/(1 - \delta)$
(c) $V(1 – \delta)$ (d) none of these

141. A cycloconverter is a device which
(a) converts A.C. into D.C. (b) converts D.C. into A.C.
(c) converts A.C. of one frequency into A.C. of other frequency (d) none of these

142. The numbers of thyristors required for 1-phase to 1-phase cyloconverter of the mid-point type and for 3-phase to 3-phase 3-pulse type are respectively
(a) 4 and 6 (b) 4 and 4
(c) 4 and 9 (d) 4 and 18

143. SMPS stands for
(a) service monitored power supply (b) self monitored power supply
(c) switched mode power supply (d) single mode power supply

144. The ASCII code is a
(a) 5-bit code (b) 7-bit code
(c) 9-bit code (d) 11-bit code

18. In RC phase shift oscillator circuits
(a) there is no need for feedback
(b) feedback factor is less than unity
(c) pure sine wave output is possible
(d) transistor parameters determine oscillation frequency

19. The highest voltage gain can be obtained from a ..... configuration
(a) CC (b) CE
(c) CB (d) both CE and CB

20. An amplifier has a power gain of 50. This gain in dB will be
(a) 17 dB (b) 31 dB
(c) 34 dB (d) 68 dB

21. In the forward region of its characteristic, a diode appears as
(a) an ON switch (b) an OFF switch
(c) a high resistance (d) a capacitor

22. The number 1000_2 is equivalent to decimal number
(a) one thousand (b) eight
(c) four (d) sixteen

23. The output of a 2-input OR gate is zero only when
(a) both inputs are 0 (b) either input is 0
(c) both inputs are 1 (d) either input is 1

24. In a JEFT, the amplification factor μ, transconductance g_m and the dynamic drain resistance r_d are related as
(a) $\mu = g_m / r_d$ (b) $\mu = r_d / g_m$
(c) $\mu = g_m . r_d$ (d) $\mu = g_m . r_d^2$

25. An FET consists of a
(a) source (b) drain
(c) gate (d) all of these

26. FETs have similar properties to
(a) PNP transistors (b) NPN transistors
(c) thermionic valves (d) unijunction transistors

27. For small values of drain-to-source voltage, JEFT behaves like a
(a) resistor (b) constant current source
(c) constant voltage source (d) negative resistance

28. A p-n junction photodiode is
(a) operated in forwarded region
(b) encased in an opaque package
(c) a very fast photo detector
(d) dependent on thermally generated minority carriers

29. Silicon is invariably used in the manufacture of photodiodes because
(a) more electron-hole pairs are generated in it
(b) its thermally-generated minority current is extremely small
(c) it is more rugged than Ge
(d) it needs less reverse bias

30. A PIN photodiode has ultrafast response due to
(a) the presence of middle I-layer
(b) heavy doping of P and N regions
(c) higher electrical conductivity of Si
(d) the wide spectral response

31. According to Boolean algebra, $(A + \bar{A})$ equals
(a) A
(b) 1
(c) 0
(d) $\bar{A}$

32. The reason of preferring FETs to bipolar transistors in integrated circuits is that
(a) they occupy very small space
(b) it has become a tradition
(c) fabrication of circuit is easy
(d) it is cheaper

33. FET has offset voltage of approximately
(a) 0.2 volt
(b) 0.6 volt
(c) 1.1 volt
(d) zero

34. Dynamic memory cells are constructed using
(a) transistors
(b) flip-flops
(c) MOSFETs
(d) FETs

35. Schottky barrier diodes can be used as
(a) low noise amplifier
(b) variable capacitance device
(c) power supply rectifier
(d) low level detector

36. An ideal amplifier has
(a) noise figure of less than 1dB
(b) noise factor of unity
(c) output signal to noise ratio (S/N) more than input S/N
(d) noise figure of more than 0dB

37. A class B push-pull amplifier has the main advantage of being free from
(a) any circuit imbalances
(b) unwanted noise
(c) even-order harmonic distortion
(d) d.c. magnetic saturation effects

38. Multistage amplifiers are used in order to achieve greater
(a) voltage amplification
(b) power gain
(c) frequency response
(d) all of these

39. If two stages of a cascaded amplifier have decibel gains of 60 and 30, then the overall gain is
(a) 90dB
(b) 1800dB
(c) 2dB
(d) 0.5dB

124. The main part of an inverter is
(a) oscillator circuit
(b) d.c. source
(c) step up transformer
(d) filter

125. Output frequency of inverter circuit depends on
(a) values of the resonant elements
(b) transformation ratio of transformer
(c) level of D.C. voltage applied
(d) none of these

126. An SCR is a
(a) two-layer two junction device
(b) three-layer two junction device
(c) four-layer three junction device
(d) four-layer four junction device

127. An SCR has
(a) one terminal
(b) two terminals
(c) three terminals
(d) four terminals

128. An SCR is operated
(a) only in reverse-biased condition
(b) only in forward biased condition
(c) both forward and reverse biased conditions
(d) none of these

129. Turn-on time for an SCR is 10 μsec. If an inductance is inserted in the anode circuit, then the turn-on time will be
(a) 10 μsec
(b) more than 10 μsec
(c) less than 10 μsec
(d) depends on the value of inductance

130. Thyristor is nothing but a
(a) controlled switch
(b) controlled transistor
(c) amplifier with large current rating
(d) amplifier with higher gain

131. The thyristor is turned off
(a) by switching off the voltage applied to the principal circuit and changing into reverse blocking mode
(b) by switching off the voltage applied to the gate circuit only
(c) by changing the thyristor into forward blocking state
(d) none of these

132. The magnitude of anode current can be controlled in thyristors only by
(a) changing the amplitude of triggered pulse
(b) changing the width of triggered pulse
(c) varying the timing of the triggered pulse with respect to the positive half cycle of the applied voltage
(d) none of these

133. Which of the followings is an operational state of a thyristor?
(a) triggering
(b) firing
(c) regulating
(d) reverse blocking

114. The basic elements of a microprocessor are
(a) ALU and memory
(b) ALU and control unit
(c) ALU, memory and I/O devices
(d) ALU, control unit and memory

115. An address is the number used by the CPU to specify
(a) a location in the memory
(b) a location in flags
(c) a location in accumulator
(d) a location in stack pointer

116. An assembler in a computer system prepares
(a) machine-language program from a symbolic language program
(b) object program
(c) assembles computer instructions and data in the machine
(d) none of these

117. Which of the following actions detect locations, and remove mistakes from a program routine?
(a) Erase
(b) Debug
(c) Diagnose
(d) Emulate

118. In microprocessor architecture, flag indicates
(a) the number of the microprocessor
(b) the name of the manufacturer
(c) the internal status of the CPU
(d) the bit size of the microprocessor

119. Stack pointer is a register which comes into use
(a) whenever a data read from the memory
(b) whenever a data is written into the memory
(c) whenever the output variable is sent out of the CPU
(d) whenever an interrupt or high priority call comes from external devices

120. The channel of JFET
(a) consists of p-type material only
(b) consists of n-type material only
(c) may consist of p- type or n-type material
(d) none of these

121. The input resistance of a MOSFET is
(a) very high as compared to that of a bipolar transistor
(b) low as compared to that of a bipolar transistor
(c) of the same order as of a bi-polar transistor
(d) none of the above

122. If the carrier of a 100 percent modulated AM wave is suppressed, the percentage power saving will be
(a) 50
(b) 33.33
(c) 100
(d) 66.66

123. An inverter is a device that converts
(a) D.C. into A.C.
(b) A.C. into D.C.
(c) A.C. into A.C. of higher frequency
(d) A.C. into A.C. of lower frequency

40. The bandwidth of an amplifier may be increased by
(a) decreasing the capacitance of its bypass capacitors
(b) minimizing its stray capacitances
(c) increasing input signal frequency
(d) cascading it

41. The main reason for the variation of amplifier gain with frequency is
(a) the presence of capacitances, both internal and external
(b) due to inter-stage transformers
(c) the logarithmic increase in its output power
(d) the Miller effect

42. Feedback in an amplifier always helps to
(a) control its output
(b) increase its gain
(c) decrease its input impedance
(d) stabilize its gain

43. Negative feedback in an amplifier
(a) lowers its lower 3 dB frequency
(b) raises its upper 3 dB frequency
(c) increases its bandwidth
(d) all of these

44. Out of the following devices, the fastest switching device is
(a) JEFT
(b) BJT
(c) MOSFET
(d) triode

45. A push-pull amplifier suppresses
(a) only the second harmonic component
(b) only the odd harmonic components
(c) only the even harmonic components
(d) both odd and even harmonic components

46. For an amplifier, the coupling method which gives the highest gain is
(a) capacitive coupling
(b) resistance coupling
(c) impedance coupling
(d) transformer coupling

47. Low frequency response of an RC coupled amplifier can be improved by
(a) increasing the coupling capacitors only
(b) increasing the by-pass capacitors only
(c) increasing the by-pass as well as the coupling capacitors
(d) decreasing the by-pass capacitors only

48. Which of the following logic Gates are universal Gates?
(a) OR and AND Gates
(b) NOR and NAND Gates
(c) OR and NOR Gates
(d) AND and NAND Gates

49. If the drain to source resistance of FET is controlled by the bias voltage V_{GS}, FET is also referred to as a
(a) voltage variable transistor
(b) current variable resistor
(c) voltage variable resistor
(d) current variable transistor

50. Static RAM is preferred over dynamic RAM when the requirement is
(a) slow speed of operation (b) larger storage capacity
(c) lower access time (d) lower power consumption

51. In a microprocessor, the address of the next instruction to be executed is stored in
(a) stack pointer (b) address latch
(c) program counter (d) general purpose register

52. After completing the execution, microprocessor returns to
(a) halt state (b) fetch state
(c) execute state (d) interrupt state

53. Number of operators required to build a 5-bit Analog to Digital converter is
(a) 5 (b) 11
(c) 21 (d) 31

54. When a transistor is used as a switch, its operation is confined in
(a) cut-off region (b) saturation region
(c) active region (d) both (a) and (b)

55. The only function of a NOT gate is to
(a) stop a signal (b) complement a signal
(c) invert an input signal (d) act as a universal gate

56. PROM is
(a) Permanent read only memory (b) Polarised read only memory
(c) Positive read only memory (d) Programmable read only memory

57. In single pulse modulation of PWM inverter, third harmonic can be eliminated if pulse width is equal to
(a) 30° (b) 60°
(c) 120° (d) 150°

58. In a 3-phase semi-converter, the three SCRs are triggered an interval of
(a) 60° (b) 90°
(c) 120° (d) 180°

59. In a single-phase full converter, if the output voltage has peak and average values of 325 V and 133 V respectively, then the firing angle is
(a) 40° (b) 140°
(c) 50° (d) 130°

60. A converter that can operate in both 3-pulse and 6-pulse mode is
(a) 1-phase full converter (b) 3-phase full wave converter
(c) 3-phase semi-converter (d) 1-phase semi-converter

102. In amplitude modulation
(a) carrier frequency is changed (b) carrier amplitude is changed
(c) three sidebands are produced (d) frequency is improved

103. One of the serious disadvantages of FM transmission is its
(a) high static noise (b) limited line-of-sight range
(c) expensive equipment (d) adjacent channel interference

104. The Fourier transform of the function f(t) = 1, is
(a) unity (b) $\pi \delta(\omega)$
(c) $2\pi \delta(\omega)$ (d) $\delta(\omega)$

105. The effect of noise in a communication system is most adverse with reference to
(a) source (b) encoder
(c) channel (d) receiver

106. The modulation index in FM signal depends on
(a) amplitude of the modulating signal (b) frequency of the modulating signal
(c) both (a) and (b) (d) none of these

107. Typical bandwidth of an FM receiver is
(a) 20 KHz (b) 200 KHz
(c) 1 MHz (d) 10 MHz

108. The amount of information in a continuous signal is
(a) zero (b) 1
(c) infinite (d) none of these

109. A communication channel has a bandwidth of 4 KHz and a signal-to-noise ratio is 25, the corresponding channel capacity will be nearly
(a) 18000 bits/sec. (b) 4000 bits/sec.
(c) 1500 bits/sec. (d) none of these

110. In frequency modulation and phase modulation
(a) frequency is constant (b) phase of the carrier is constant
(c) carrier amplitude is constant (d) all of these

111. In AM transmission, the frequency which is not transmitted is
(a) upper side frequency (b) lower side frequency
(c) audio frequency (d) carrier frequency

112. In AM system, full information can be conveyed by transmitting only
(a) the carrier (b) the upper sideband
(c) the lower sideband (d) any one sideband

113. In FM, when frequency deviation is doubled,
(a) modulation is doubled (b) modulation is halved
(c) carrier swing is halved (d) modulation index is decreased

92. For proper functioning of a clamper, time constant of the circuit should be
(a) large
(b) small
(c) equal to signal time period
(d) greater than five times the signal time period

93. The number of diodes required in a bridge rectifier circuit is
(a) one (b) two
(c) three (d) four

94. A half wave rectifier has a load resistance R and a capacitance filter connected across the load. The capacitance of the filter is C. It is desired that the output voltage should have small ripple. Then,
(a) RC should be very large (b) RC should be very small
(c) C should be reciprocal of R (d) none of these

95. A byte is a group of
(a) 2 bits (b) 4 bits
(c) 8 bits (d) 16 bits

96. The chief advantage of Scottky TTL logic family is its least
(a) power dissipation (b) propagation delay
(c) fan-in (d) noise immunity

97. The main advantage claimed for ECL family of logic gates is its
(a) very large fan-in (b) use of negative power supply voltage
(c) extremely low propagation time (d) least power dissipation

98. CMOS circuits are extensively used for one-chip computers mainly because of their extremely
(a) low power dissipation (b) large packing density
(c) high noise immunity (d) low cost

99. The output of each gate is connected to the input of the other and this feedback combination is called
(a) Transistor (b) MOSFETs
(c) flip-flops (d) FETs

100. The main purpose of modulation is to
(a) Combine two waves of different frequencies
(b) achieve wave-shaping of the carrier wave
(c) transmit low-frequency information over long distances efficiently
(d) produce sidebands

101. Demodulation
(a) is performed at the transmitting station (b) removes sidebands
(c) rectifies modulated signal (d) is opposite of modulation

61. A mono-stable multi-vibrator (MMV) circuit
(a) has no stable state
(b) gives two output pulses for one input trigger pulse
(c) returns to its stand-by state automatically
(d) has no energy storage element

62. A bi-stable multi-vibrator (BMV) is a ..... oscillator
(a) triggered (b) free-running
(c) sine-wave (d) sawtooth

63. A mono-stable multivibrator (MMV) is frequently used
(a) in memory and timing circuits (b) for producing triangular waves
(c) in counting circuits (d) for generation of distorted waves

64. Non-sinusoidal waveforms
(a) are departures from sine waveform (b) have low mark-to-space ratio
(c) are much easier to generate (d) are unfit for digital operation

65. The frequency of an Astable Multivibrator (AMV) depends mainly on
(a) value of collector load resistors (b) RC values of the circuit
(c) value of transistor β (d) width of the input pulse

66. The number of memory chips of size 1K × 4 bits required to build a memory bank of size 16 K × 8 bits is
(a) 64 (b) 32
(c) 16 (d) 8

67. The interface chip used for data transmission between 8086 and a 16-bit ADC is
(a) 8259 (b) 8255
(c) 8253 (d) 8251

68. The stack pointer in the 8085 microprocessor is a
(a) 16-bit register that point to stack memory locations
(b) a 16-bit accumulator
(c) memory location in the stack
(d) flag register used for the stack

69. A D/A converter uses a ladder of +10V full scale output. The number of bits required at its input for a resolution of 5mV is
(a) 7 (b) 8
(c) 9 (d) 11

70. A program that translates symbolically represented instructions into their binary equivalents is called
(a) loader (b) assembler
(c) linker (d) autoloader

71. Cycle time of Random Access Memory (RAM) is the time required between successive
(a) access to memory (b) clocks
(d) delete operations (d) read/write operations

72. The number of flip flops required in a decade counter is
(a) 2 (b) 3
(c) 4 (d) 10

73. The bus used to transfer data from main memory to a peripheral device is
(a) data bus (b) input bus
(c) DMA bus (d) output bus

74. An I/O processor controls the flow of information between
(a) catch memory and I/O devices (b) main memory and I/O devices
(c) two I/O devices (d) catch memory and main memory

75. A microprocessor with a 12-bit address bus will be able to access
(a) 1 kilobyte of memory (b) 4 kilobytes of memory
(c) 8 kilobytes of memory (d) 0.4 kilobytes of memory

76. In microprocessors, flag is a character for
(a) identification of a word (b) occurrence of some condition
(c) marking a tagging (d) all of these

77. In microprocessors, return from a subroutine is affected by
(a) a jump instruction (b) an RST instruction
(c) a RET instruction (d) a hardware interrupt signal

78. A single instruction to clear the lower four bits of the accumulator in 8085 assembly language is
(a) XRIOFH (b) ANIFOH
(c) XRIFOH (d) ANOFH

79. In 8085 microprocessor system, the direct addressing instruction is
(a) MOVA, B (b) MOVB, OAH
(c) MOVC, M (d) STA addr

80. A modulator is a system to
(a) separate two frequencies
(b) impress the information on to a radio frequency carrier
(c) extract information from the carrier
(d) amplify the audio frequency signal

81. The most commonly used filters in SSB generation are
(a) RC (b) mechanical
(c) LC (d) low pass

82. The AM broadcast band is given by
(a) 10 KHz to 30 KHz (b) 500 KHz to1500 KHz
(c) 3 KHz to 30 MHz (d) 30 MHz to 300 MHz

83. The number of AM broadcast stations that can be accompanied in a 100 KHz bandwidth for the highest modulating frequency of 5 KHz will be
(a) 5 (b) 10
(c) 20 (d) 100

84. For satellite communication, the frequency should be
(a) less than the critical frequency of ionosphere
(b) equal to the critical frequency of ionosphere
(c) more than the critical frequency of ionosphere
(d) anyone of these

85. The antenna employed in television receivers is a
(a) half-wave dipole (b) yagi antenna
(c) rhombic antenna (d) horn antenna

86. For an FM wave of carrier 100 MHz, modulating frequency 10 KHz and the maximum frequency deviation of 1 MHz, the bandwidth required is nearly
(a) 20 KHz (b) 1 MHz
(c) 2 MHz (d) 5 MHz

87. In FM, when frequency deviation is doubled
(a) modulation is doubled (b) modulation is halved
(c) carrier swing is halved (d) modulation index is decreased

88. 100% modulation is produced in AM when carrier
(a) frequency equals signal frequency (b) frequency exceeds signal frequency
(c) amplitude equals signal amplitude (d) amplitude exceeds signal amplitude

89. The basic function of an electronic filter circuit in radio communication is to
(a) replace tuning circuits
(b) eliminate ripples in D.C. power supplies
(c) separate different frequencies in a composite signal
(d) divert RF currents out of a given circuit

90. The clipping level is primarily determined by
(a) the shape of the input waveform (b) battery voltage
(c) value of the resistor (d) knee voltage of the diode

91. The primary function of a clamper circuit is to
(a) suppress variations in signal voltage (b) raise positive half-cycle of the signal
(c) lower negative half-cycle of the signal (d) introduce a D.C. level into an A.C. signal