MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO
JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE
UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, 2014

ELECTRICAL 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.

1. The most highly doped region in a transistor is
   - (a) base
   - (b) collector
   - (c) emitter
   - (d) both emitter and collector

2. A photo diode works on the principle of
   - (a) photo-voltaic effect
   - (b) photo-conductive effect
   - (c) photo-electric effect
   - (d) photo-chemical effect

3. In transistors, highest voltage gain can be achieved in
   - (a) CC configuration
   - (b) CE configuration
   - (c) CB configuration
   - (d) both CE and CB configurations

4. 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

5. Out of the following devices, the fastest switching device is
   - (a) JFET
   - (b) BJT
   - (c) MOSFET
   - (d) Triode

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

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

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

9. An AND gate
   (a) implements logic addition
   (b) is equivalent to a series switching circuit
   (c) is an any-or-all gate
   (d) is equivalent to a parallel switching circuit

10. A unique advantageous feature of CMOS family is its
    (a) use of NMOS circuits
    (b) power dissipation in nanowatt range
    (c) speed
    (d) dependence on frequency for power dissipation

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

12. PROM is
    (a) permanent read only memory   (b) polarized read only memory
    (c) positive read only memory   (d) programmable read only memory

13. 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

14. In a microprocessor, the bus which is used to transfer data from main memory to peripheral device is
    (a) data bus   (b) input bus
    (c) DMA bus   (d) output bus

15. In a microprocessor, an instruction register is storage for
    (a) location of data in memory
    (b) location of instruction in memory
    (c) address of the next instruction to be executed
    (d) binary code for the instruction to be executed

16. 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

17. The AM broadcast band is given by
    (a) 10 KHz to 30 KHz   (b) 500 KHz to 1500 KHz
    (c) 3 KHz to 30 MHz   (d) 30 MHz to 300 MHz

18. The most useful modulation technique for high fidelity audio broadcasting on radio in current practice is
    (a) amplitude modulation   (b) frequency modulation
    (c) pulse amplitude modulation   (d) pulse code modulation

19. The FM radio frequency range is approximately
    (a) 250-300 MHz   (b) 150-200 MHz
    (c) 90-105 MHz   (d) 30-70 MHz

20. In FM, the noise can be further decreased by
    (a) decreasing deviation
    (b) increasing deviation
    (c) keeping the deviation constant
    (d) none of these

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

22. The demodulation of the sound signals in a TV receiver is accomplished by
    (a) linear detector
    (b) product detector
    (c) discriminator
    (d) envelope detector

23. An SCR is also called a
    (a) triac
    (b) thyristor
    (c) diac
    (d) unijunction transistor

24. A power chopper converts
    (a) A.C to D.C.
    (b) D.C. to D.C.
    (c) D.C. to A.C.
    (d) A.C. to A.C.

25. In FM modulation ,when the modulation index increases, transmitted power is
    (a) Constant
    (b) Increased
    (c) Decreased
    (d) none of these

26. In a fully controlled converter the load voltage is controlled by which of the following quantity.
    (a) Extension angle
    (b) Firing angle
    (c) Conduction angle
    (d) None of these

27. Reverse saturation current in a transistor
    (a) Decreases with increase in temperature
    (b) Increases with increase in temperature
    (c) Remains same with increase in temperature
    (d) None of these

28. A transistor can be used as an amplifier in its
    (a) Saturation region
    (b) Active region
    (c) Both saturation and active region
    (d) Cut-off region

29. A common source FET amplifier has a load resistance $R_L = 500 k\Omega$ $r_d = 100 k\Omega$ and $\mu = 24$. The voltage gain is
    (a) 30
    (b) 25
    (c) 20
    (d) 100

30. If the peak value of the input voltage to a half wave rectifier is 28.28 volts and no filter is used the maximum dc voltage across the load will be
    (a) 20.2V
    (b) 15 V
    (c) 9 V
    (d) 14.14 V

31. It is required to construct a counter to count up to 100(decimal). The minimum number of flip flops required to construct the counter is
    (a) 8
    (b) 7
    (c) 6
    (d) 5

32. Which of the following Boolean rules is correct?

(a) A + 0 = 0

(b) A + 1 = 1

(c) A + A = A.A

(d) A + AB = A + B

33. The bit sequence 0010 is serially entered (right-most bit first) into a 4-bit parallel out shift register that is initially clear. What are the Q outputs after two clock pulses?

(a) 0000

(b) 0010

(c) 1000

(d) 1111

34. Which interrupt has the highest priority?

(a) INTR

(b) TRAP

(c) RST6.5

(d) RST7.5

35. A microprocessor with 12 address line is capable of addressing

(a) 1024 locations

(b) 2028 locations

(c) 4096 locations

(d) 64K locations

36. A carrier is simultaneously modulated by two sine waves with modulation indices of 0.4 and 0.3. The resultant modulation index will be

(a) 1.0

(b) 0.7

(c) 0.5

(d) 0.35

37. Carrier signal has

(a) constant magnitude

(b) constant frequency

(c) variable frequency

(d) variable time

38. Turn-off times of a thyristor

(a) depends upon stored charge in the junction.

(b) is a constant.

(c) depends on load.

(d) none of these

39. A zener diode

(a) Has a high forward voltage rating

(b) Has a sharp breakdown at low reverse voltage

(c) Is useful as an amplifier

(d) Has a negative resistance

40. Which one of the following specifications is not correct for a common collector amplifier?

(a) High input impedance

(b) Low output impedance

(c) High voltage gain

(d) High current gain

41. The POS form of expression is suitable for circuit using

(a) XOR

(b) NAND

(c) AND

(d) NOR

42. The program counter in a 8085 microprocessor is a 16-bit register, because

(a) It counts 16 bits at a time

(b) There are 16 address lines

(c) It facilities the user storing 16 bit data temporarily

(d) It has to fetch two 8-bit data at a time

43. Output of the assembler in machine code is referred to as

(a) Object program

(b) Source program

(c) Macroinstruction

(d) Symbolic instruction

44. Both the ALU and control section of CPU employ which special purpose storage locations?
    (a) Buffers
    (b) Decoders
    (c) Accumulators
    (d) Registers

45. Eight memory chips of 32x4 bit size have their address buses connected together. What is the size of this memory system?
    (a) 512x2 bits
    (b) 256x4 bits
    (c) 64x16 bits
    (d) 32x32 bits

46. In AM, the carrier is changed by a modulating signal. What parameter of the carrier is changed?
    (a) amplitude
    (b) frequency
    (c) pulse width
    (d) phase

47. In amplitude modulation, frequency is
    (a) zero
    (b) constant
    (c) one
    (d) variable

48. In AM modulation when the modulation index increases, transmitted power is
    (a) constant
    (b) increased
    (c) decreased
    (d) none of these

49. Out of the following semiconductor power devices, which one is not a current triggered device?
    (a) thyristor
    (b) GTO
    (c) TRIAC
    (d) MOSFET

50. With gate open, if the supply voltage exceeds the break over voltage of SCR, then SCR will conduct
    (a) false
    (b) true
    (c) for dc only
    (d) for ac only

Part B - Short Answer Questions (100 Marks)

All questions carry equal marks of 5 each.

51. Draw and describe the V-I characteristics of a *p-n* junction diode. Also explain the phenomena 'Zener Breakdown' and 'Avalanche Breakdown'.

52. What are the universal gates? Why are they called so? Show how the operations AND, OR, and NOT can be performed using only the NAND gates.

53. With the help of a circuit diagram, briefly describe the operation of a push-pull amplifier.

54. List the advantages and disadvantages of GTOs.

55. Why are full-wave converters a much better choice than half-wave converters? Discuss.

56. Discuss briefly the sinusoidal pulse width modulation technique used in inverters. What are the disadvantages of this technique?

57. What do you mean by multiplexing? What is the difference between frequency division multiplexing and time division multiplexing?

58. Draw a comparison between FM and AM.

59. In an FM circuit, the modulation index is 10, and the highest modulation frequency is 20 KHz. What is the approximate bandwidth of the resultant FM signal?

60. Explain the working principle of an inverter.

61. What are α and β in a transistor? How are they related?

62. Define various types of pulse modulation.

63. Explain RC phase shift oscillator.

64. What is the role of doping of impurities in pure silicon or germanium?

65. How does a half-wave rectifier differ from the full-wave circuit in the following aspects?
    (a) fundamental ripple frequency in the output   (b) Rectified d.c. voltage
    (c) Ripple factor   (d) Average d.c. load current and
    (e) Peak-inverse voltage

66. Draw the 8085 pin diagram and label the pins.

67. In the peripheral I/O method, explain why data cannot be transferred directly from a register to an output port without using the accumulator. Can it be possible for memory mapped I/O?

68. Explain why a latch is used for an output port but a tri-state buffer can be used for an input port.

69. A 100MHz carrier is frequency modulated by a sinusoidal signal of 10 kHz so that the maximum frequency deviation is 1 MHz. Determine the approximate bandwidth of the FM Carrier. If the modulating signal amplitude is doubled what would be the bandwidth?

70. Explain briefly the various types of triggering methods of an SCR.

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