MIZORAM PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF INSPECTOR OF LEGAL METROLOGY UNDER FOOD, CIVIL SUPPLIES & CONSUMER AFFAIRS DEPARTMENT, GOVERNMENT OF MIZORAM, DECEMBER, 2018

COMPUTER SCIENCE & ENGINEERING

PAPER - I

Time Allowed : 2 hours Full Marks : 200

All questions carry equal marks of two (2) each.
Attempt all questions.

1. The union of the sets {1, 2, 5} and {1, 2, 6} is the set _____
(a) {1, 2, 6, 1} (b) {1, 2, 5, 6}
(c) {1, 2, 1, 2} (d) {1, 5, 6, 3}

2. Which of the following statements for a simple graph is correct?
(a) Every path is a trail
(b) Every trail is a path
(c) Every trail is a path as well as every path is a trail
(d) None of these

3. What is the number of edges present in a complete graph having n vertices?
(a) (n*(n+1))/2 (b) (n*(n-1))/2
(c) n (d) Information given is insufficient

4. Assume the R is a relation on a set A, aRb is partially ordered such that a and b are _____
(a) reflexive (b) transitive
(c) symmetric (d) reflexive and transitive

5. Which of the following is a not a part of 5-tuple finite automata?
(a) Input alphabet (b) Transition function
(c) Initial State (d) Output Alphabet

6. The O/P of Mealy machine can be represented in the following format:
(a) Op(t)= d(Op(t)) (b) Op(t)= d(Op(t)i(t))
(c) Op(t): S (d) None of these

7. When are 2 finite states equivalent?
(a) Same number of transitions (b) Same number of states
(c) Same number of states as well as transitions (d) Both are final states

8. Can a DFA recognize a palindrome number?
(a) Yes (b) No
(c) Yes, with input alphabet as S* (d) Can't be determined

9. The Grammar can be defined as: G=(V, S, p, S)
In the given definition, what does S represents?
(a) Accepting State (b) Starting Variable
(c) Sensitive Grammar (d) None of these

10. Which of the following statements are correct for a concept called inherent ambiguity in CFL?
(a) Every CFG for L is ambiguous (b) Every CFG for L is unambiguous
(c) Every CFG is also regular (d) None of these

11. The set of all Equivalence classes of a set A of cardinality C
(a) forms a partition of A (b) is of cardinality 2C
(c) has the same cardinality as A (d) none of these

12. The number of different spanning trees in complete graph of four vertices is_____
(a) 14 (b) 15
(c) 16 (d) 17

13. The Floyd-Warshall all-pairs shortest path algorithm for finding the shortest distances between nodes in a graph is an example of:
(a) A Dynamic Programming (b) A Greedy Algorithm
(c) A divide and conquer technique (d) Branch and bound technique

14. A _____ point of a fuzzy set A is a point $x \in X$ at which $\mu A(x) = 0.5$
(a) Core (b) Support
(c) Cross-over (d) a-Cut

15. Which of the following is/are the operations performed by kruskal's algorithm in a graph G
i) sort the edges of G in increasing order by length
ii) keep a subgraph S of G initially empty
iii) builds a tree one vertex at a time
(a) i, and ii only (b) ii and iii only
(c) i and iii only (d) all i, ii and iii

16. Dijkstra algorithm is also called the _____ shortest path problem.
(a) multiple source (b) single source
(c) single destination (d) multiple destination

17. Given that $a_0 = 1$, $a_n = n + (-1)^n a_{n-1}$ for $n \geq 2$. What is the value of a_4?
(a) 1 (b) 4
(c) 5 (d) 8

18. A cycle on n vertices of a graph is isomorphic to its complement. The value of n is
(a) 2 (b) 4
(c) 6 (d) 5

19. The height h(A) of a fuzzy set A is defined as h(A) =sup A(x) where x belongs to A. Then the fuzzy set A is called normal when
(a) h(A)=0 (b) h(A)<0
(c) h(A)=1 (d) h(A)<1

20. Which of the given are correct?

(a) Moore machine has 6-tuples
(b) Mealy machine has 6-tuples
(c) Both Mealy and Moore has 6-tuples
(d) None of these

21. The minimum number of states required to recognize an octal number divisible by 3 are/is

(a) 1
(b) 3
(c) 5
(d) 7

22. A Language for which no DFA exist is a_____

(a) Regular Language
(b) Non-Regular Language
(c) May be Regular
(d) Cannot be said

23. A DFA cannot be represented in the following format

(a) Transition graph
(b) Transition Table
(c) C code
(d) None of these

24. Which of the following is an application of Finite Automaton?

(a) Compiler Design
(b) Grammar Parsers
(c) Text Search
(d) All of these

25. It is less complex to prove the closure properties over regular languages using

(a) NFA
(b) DFA
(c) PDA
(d) Can't be said

26. Which data structures find their applications in BFS and DFS Traversal mechanisms on a Tree respectively?

(a) Graph & Stack
(b) Queue & Stack
(c) Queue & Graph
(d) None of these

27. Which is the correct algorithmic sequence for the conversion of an expression from Infix to Prefix?

i. Change of every '(' (opening bracket) by ')' (closing bracket) and vice-versa.
ii. Reversal of an infix expression.
iii. Conversion of the modified expression into postfix form.
iv. Reversal of postfix expression.

(a) i, ii, iii, iv
(b) iii, i,iv, ii
(c) ii ,i, iii, iv
(d) iv, ii, i, iii

28. Which of the following is the Worst-case running time of Quick Sort?

(a) O (n log n)
(b) O (n^2)
(c) O (log n)
(d) O (n^2 / 4)

29. What would happen if the balance factor of a node in an AVL tree is '1'?

(a) Heights of left and right subtrees become equal
(b) Height of left subtree is one more than the height of right subtree
(c) Height of left subtree is one less than the height of right tree
(d) None of these

30. In a max-heap the element with the greatest key is always located in which node?

(a) leaf
(b) root
(c) first node of left sub tree
(d) first node of right sub tree

31. Preorder and inorder of a binary tree is given

Preorder —— A B D H E C F I G J K

Inorder —— D H B E A I F C J G K

What will be the postorder?

(a) H D E B I F J K G C A
(b) H D E B F I J K G C A
(c) H D E B I F J K CG A
(d) None of these

32. Leaves of which of the following trees are at the same level?

(a) Binary tree
(b) B-tree
(c) AVL-tree
(d) Normal Tree

33. What sorting algorithm have their best and worst case times equal ?

(a) heap sort and selection sort
(b) insersition sort & merge sort
(c) merge sort and heap sort
(d) None of these

34. In order to get the information stored in a Binary Search Tree in the descending order, one should traverse it in which of the following order?

(a) left, root, right
(b) root, left, right
(c) right, root, left
(d) right, left, root

35. For an array containing 8 elements as : 42 29 75 11 65 58 60 18 what will be the result of sorting in ascending order using bubble sort after 2 passes have completed?

(a) 11 29 42 18 58 60 65 75
(b) 29 42 11 65 58 60 18 75
(c) 11 29 42 58 18 60 65 75
(d) 29 11 42 58 60 18 65 75

36. For an undirected graph G with n vertices and e edges, the sum of the degrees of each vertex is

(a) ne
(b) 2n
(c) 2e
(d) e^n

37. An undirected graph G with n vertices and e edges is represented by adjacency list. What is the time required to generate all the connected components?

(a) O(n)
(b) O(e)
(c) O(e+n)
(d) $O(e^2)$

38. What are the disadvantages of arrays?

(a) We must know before hand how many elements will be there in the array
(b) There are chances of wastage of memory space if elements inserted in an array are lesser than than the allocated size
(c) Insertion and deletion becomes tedious
(d) All of these

39. What is a sparse array?

(a) Data structure for representing arrays of records
(b) Data structure that compactly stores bits
(c) An array in which most of the elements have the same value
(d) None of these

40. In the following scenarios, when will you use selection sort?

(a) The input is already sorted
(b) A large file has to be sorted
(c) Large values need to be sorted with small keys
(d) Small values need to be sorted with large keys

41. What is the disadvantage of selection sort?

(a) It requires auxiliary memory
(b) It is not scalable
(c) It can be used for small keys
(d) None of these

42. The given array is arr = {1,2,3,4,5}. (bubble sort is implemented with a flag variable)The number of iterations in selection sort and bubble sort respectively are,

(a) 5 and 4
(b) 1 and 4
(c) 0 and 4
(d) 4 and 1

43. The given array is arr = {1,2,4,3}. Bubble sort is used to sort the array elements. How many iterations will be done to sort the array?

(a) 4
(b) 2
(c) 1
(d) 0

44. QuickSort can be categorized into which of the following?

(a) Brute Force technique
(b) Divide and conquer
(c) Greedy algorithm
(d) Dynamic programming

45. The given array is arr = {2,6,1}. What are the pivots that are returned as a result of subsequent partitioning?

(a) 1 and 6
(b) 6 and 1
(c) 2 and 6
(d) None of these

46. What is the need for a circular queue?

(a) effective usage of memory
(b) easier computations
(c) all of these
(d) none of these

47. What is the space complexity of a linear queue having n elements?

(a) O(n)
(b) O(nlogn)
(c) O(logn)
(d) O(1)

48. What is the best case complexity in building a heap?

(a) O(nlogn)
(b) $O(n^2)$
(c) O(n*longn *logn)
(d) O(n)

49. What is the location of parent node for any arbitary node I in a queue?

(a) (i/2) position
(b) (i+1)/ position
(c) floor(i/2) position
(d) ceil(i/2) position

50. What data structure would you mostly likely see in a non recursive implementation of a recursive algorithm?

(a) LinkList
(b) Stack
(c) Queue
(d) Tree

51. Which of the following memories uses one transistor and one capacitor as basic memory unit?

(a) SRAM
(b) DRAM
(c) Flash Memory
(d) Both SRAM and DRAM

52. In which region a transistor acts as an open switch?

(a) cut off region
(b) inverted region
(c) active region
(d) saturated region

53. In an SR latch built from NOR gates, which condition is not allowed

(a) S = 0, R = 0 (b) S = 0, R = 1

(c) S = 1, R = 0 (d) S = 1, R = 1

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

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

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

55. How many 3-line-to-8-line decoders are required for a 1-of-32 decoder?

(a) 1 (b) 2

(c) 4 (d) 8

56. The simplest equation which implements the K-map shown below is:

	$\overline{C}$	C
$\overline{A}\,\overline{B}$	0	0
$\overline{A}\,B$	1	1
$A\,B$	1	1
$A\,\overline{B}$	0	1

(a) $X = AC + B$ (b) $X = A\overline{B}$

(c) $X = AB\overline{C} + ABC + A\overline{B}C$ (d) $X = AB + \overline{A}B$

57. Which of the following statements accurately represents the two BEST methods of logic circuit simplification?

(a) Karnaugh mapping and circuit waveform analysis

(b) Boolean algebra and Karnaugh mapping

(c) Actual circuit trial and error evaluation and waveform analysis

(d) Boolean algebra and actual circuit trial and error evaluation

58. 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

59. To operate correctly, starting a ring counter requires:

(a) clearing one flip-flop and presetting all the others.

(b) clearing all the flip-flops.

(c) presetting one flip-flop and clearing all the others.

(d) presetting all the flip-flops.

60. A full-adder has a $C_{in} = 0$. What are the sum (S) and the carry (C_{out}) when A = 1 and B = 1?

(a) S = 0, $C_{out} = 0$ (b) S = 0, $C_{out} = 1$

(c) S = 1, $C_{out} = 0$ (d) S = 1, $C_{out} = 1$

61. What should be done to unused inputs on TTL gates?

(a) They should be left disconnected so as not to produce a load on any of the other circuits and to minimize power loading on the voltage source.

(b) All unused gates should be connected together and tied to V through a 1k W resistor.

(c) All unused inputs should be connected to an unused output; this will ensure compatible loading on both the unused inputs and unused outputs.

(d) Unused AND and NAND inputs should be tied to V_{CC} through a 1 k W resistor; unused OR and NOR inputs should be grounded.

62. Which of the following summarizes the important features of ECL?

(a) Low noise margin, low output voltage swing, negative voltage operation, fast, and high power consumption

(b) Good noise immunity, negative logic, high frequency capability, low power dissipation, and short propagation time

(c) Slow propagation time, high frequency response, low power consumption, and high output voltage swings

(d) Poor noise immunity, positive supply voltage operation, good low frequency operation, and low power

63. Which of the following statements apply to CMOS devices?

(a) The devices should not be inserted into circuits with the power on.

(b) All tools, test equipment, and metal workbenches should be tied to earth ground.

(c) The devices should be stored and shipped in antistatic tubes or conductive foam.

(d) All of these

64. A serial in/parallel out, 4-bit shift register initially contains all 1s. The data nibble 0111 is waiting to enter. After four clock pulses, the register contains _____.

(a) 0000 (b) 1111

(c) 0111 (d) 1000

65. A BCD counter is a _____.

(a) binary counter (b) full-modulus counter

(c) decade counter (d) divide-by-10 counter

66. If the n-MOS and p-MOS of the CMOS inverters are interchanged the output is measured at:

(a) Source of the both transistor (b) Drains of the both transistor

(c) Drain of n-MOS and source of p-MOS (d) Source of n-MOS and drain of p-MOS

67. Which of the following is a type of error associated with digital-to-analog converters (DACs)?

(a) nonmonotonic error (b) incorrect output codes

(c) offset error (d) nonmonotonic and offset error

68. In a comparator, if we get input as A>B then the output will be

(a) 1 (b) 0

(c) A (d) B

69. The base emitter voltage in a cut off region of silicon transistor is_____

(a) greater than 0.7V (b) equal to 0.7V

(c) less than 0.7V (d) cannot be predicted

70. The switching of power with a PNP transistor is called_____

(a) sourcing current
(b) sinking current
(c) forward sourcing
(d) reverse sinking

71. The collector current will not reach the steady state value instantaneously because of_____

(a) stray capacitances
(b) resistances
(c) input blocking capacitances
(d) coupling capacitance

72. How many two-input AND and OR gates are required to realize Y = CD+EF+G?

(a) 2, 2
(b) 2, 3
(c) 3, 3
(d) None of these

73. DeMorgan's theorem states that

(a) (AB)' = A' + B'
(b) (A + B)' = A' * B
(c) A' + B' = A'B'
(d) None of these

74. Simplify Y = AB' + (A' + B)C

(a) AB' + C
(b) AB + AC
(c) A'B + AC'
(d) AB + A

75. Transistor–transistor logic (TTL) is a class of digital circuits built from

(a) Transistors only
(b) Bipolar junction transistors (BJT)
(c) Resistors
(d) Bipolar junction transistors (BJT) and resistors

76. The first machine cycle of an instruction is always

(a) A memory read cycle
(b) A fetch cycle
(c) An I/O read cycle
(d) A memory write cycle

77. A number of 1-bit registers used in microprocessors to indicate certain conditions are usually referred to as

(a) shift registers
(b) flags
(c) counters
(d) unit register

78. Which of the following buses is primarily used to carry signals that direct other Instructions to find out what type of operation is being performed?

(a) data bus
(b) control bus
(c) address bus
(d) address decoder bus

79. The performance of a pipelined processor suffers if

(a) the pipeline stages have different delays
(b) consecutive instructions are dependent on each other
(c) the pipeline stages share hardware resources
(d) all of these

80. How many address lines are needed to address each memory locations in a 2048×4 memory chip?

(a) 10
(b) 11
(c) 8
(d) 12

81. Memory access in RISC architecture is limited to instructions
(a) CALL and RET
(b) PUSH and POP
(c) STA and LDA
(d) MOV and JMP

82. Which memory has lowest access time?
(a) Registers
(b) Magnetic disk
(c) Main Memory
(d) Pen Drive

83. The minimum time delay between two successive memory read operations is _____.
(a) Cycle time
(b) Latency
(c) Delay
(d) None of these

84. A CPU has 24-bit instructions. A program starts at address 300 (in decimal). Which one of the following is a legal program counter (all values in decimal)?
(a) 400
(b) 500
(c) 600
(d) 700

85. Which method/s of representation of numbers occupies large amount of memory than others ?
(a) Sign-magnitude
(b) 1's compliment
(c) 2's compliment
(d) 1's & 2's compliment

86. How many bits are required to store one BCD digit ?
(a) 1
(b) 2
(c) 3
(d) 4

87. The address space is 22 bits, the memory is 32 bit word addressable. What is the memory size?
(a) 16MB
(b) 512KB
(c) 4MB
(d) 1GB

88. The ALU makes use of _____ to store the intermediate results.
(a) Accumulators
(b) Registers
(c) Heap
(d) Stack

89. _____ are numbers and encoded characters, generally used as operands.
(a) Input
(b) Data
(c) Information
(d) Stored Values

90. The I/O interface required to connect the I/O device to the bus consists of _____
(a) Address decoder and registers
(b) Control circuits
(c) Address decoder, registers and Control circuits
(d) Only Control circuits

91. The time delay between two successive initiation of memory operation _____
(a) Memory access time
(b) Memory search time
(c) Memory cycle time
(d) Instruction delay

92. The internal Components of the processor are connected by _____
(a) Processor intra-connectivity circuitry
(b) Processor bus
(c) Memory bus
(d) Rambus

93. _____ are used to over come the difference in data transfer speeds of various devices.

(a) Speed enhancing circuitory (b) Bridge circuits

(c) Multiple Buses (d) Buffer registers

94. The main advantage of multiple bus organisation over single bus is _____

(a) Reduction in the number of cycles for execution (b) Increase in size of the registers

(c) Better Connectivity (d) None of these

95. In case of Zero-address instruction method, the operands are stored in _____

(a) Registers (b) Accumulators

(c) Push down stack (d) Cache

96. The addressing mode which makes use of in-direction pointers is _____

(a) Indirect addressing mode (b) Index addressing mode

(c) Relative addressing mode (d) Offset addressing mode

97. Which method/s of representation of numbers occupies large amount of memory than others ?

(a) Sign-magnitude (b) 1's compliment

(c) 2's compliment (d) 1's & 2's compliment

98. The pipelining process is also called as _____

(a) Superscalar operation (b) Assembly line operation

(c) Von neumann cycle (d) None of these

99. If a unit completes its task before the allotted time period, then

(a) It'll perform some other task in the remaining time

(b) Its time gets reallocated to different task

(c) It'll remain idle for the remaining time

(d) None of these

100. Which of the architecture is power efficient?

(a) CISC (b) RISC

(c) ISA (d) IANA

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