

**MIZORAM PUBLIC SERVICE COMMISSION**  
**COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF M.E.S.**  
**UNDER POWER & ELECTRICITY DEPARTMENT, AUGUST, 2018.**

**COMPUTER SCIENCE & ENGINEERING**  
**PAPER - I**

Time Allowed : 3 hours

FM : 200

**SECTION - A (Multiple Choice questions)**

**(100 Marks)**

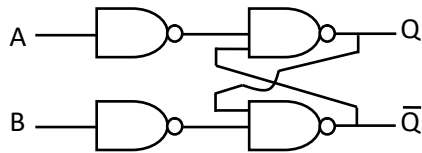
*All questions carry equal mark of 2 each. Attempt all questions.*

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

1.  $\{x: x \text{ is a real number between } 1 \text{ and } 2\}$  is an
  - (a) Infinite set
  - (b) Finite set
  - (c) Empty set
  - (d) None of these
2. Which of the following is subset of set  $\{1, 2, 3, 4\}$ .
  - (a)  $\{1, 2\}$
  - (b)  $\{1, 2, 3\}$
  - (c)  $\{1\}$
  - (d) All of these
3. 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
4. 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
5. Which of the following ways can be used to represent a graph?
  - (a) Adjacency List and Adjacency Matrix
  - (b) Incidence Matrix
  - (c) Adjacency List, Adjacency Matrix as well as Incidence Matrix
  - (d) None of these
6. A language is regular if and only if
  - (a) accepted by DFA
  - (b) accepted by PDA
  - (c) accepted by LBA
  - (d) accepted by Turing machine
7. Which of the following is not a regular expression?
  - (a)  $[(a+b)^*(aa+bb)]^*$
  - (b)  $[(0+1)-(0b+a1)^*(a+b)]^*$
  - (c)  $(01+11+10)^*$
  - (d)  $(1+2+0)^*(1+2)^*$

8. If NFA of 6 states excluding the initial state is converted into DFA, maximum possible number of states for the DFA is ?
- (a) 64 (b) 32  
(c) 128 (d) 127
9. NFA, in its name has 'non-deterministic' because of :
- (a) The result is undetermined  
(b) The choice of path is non-deterministic  
(c) The state to be transited next is non-deterministic  
(d) All of these
10. Production Rule:  $aAb \rightarrow agb$  belongs to which of the following category?
- (a) Regular Language (b) Context free Language  
(c) Context Sensitive Language (d) Recursively Enumerable Language
11. 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
12. PROM stands for
- (a) Programmable Read Only Memory (b) Pre-fed Read Only Memory  
(c) Pre-required Read Only Memory (d) Programmed Read Only Memory
13. Which of the following is not true in Boolean algebra?
- (a)  $x + 1 = 1$  (b)  $x + x' = 1$   
(c)  $x \cdot x' = 0$  (d)  $x \cdot x = 1$
14. Which of the Boolean expression is false?
- (a)  $(x + y + z)' = x' + y' + z'$  (b)  $(xyz)' = x' + y' + z'$   
(c)  $(x + y + z)' = x' y' z'$  (d)  $(xyz)' = (xy)' + z'$
15. A dynamic RAM consist of
- (a) 6 transistors (b) 2 transistor and 2 capacitor  
(c) 1 transistor and 1 capacitor (d) 1 capacitor only
16. The minimum number of NAND gate require to implement the Boolean function  $F=(x' + y')(z + w)$  is
- (a) 3 (b) 4  
(c) 5 (d) 6
17. Boolean expression for the output of XNOR logic gates with inputs A and B is
- (a)  $AB' + A'B$  (b)  $(AB)' + AB$   
(c)  $(A'+B)(A+B')$  (d)  $(A'+B')(A+B)$
18. The number of distinct Boolean expressions of 4 input is
- (a) 16 (b) 256  
(c) 1024 (d) 65536

19. The circuit below is a



- (a) JK Flip Flop
  - (b) Johnson Counter
  - (c) RS Latch
  - (d) None of these
20. The advantage of dual slope ADC in Digital voltmeter application is that
- (a) has fast conversion time
  - (b) High accuracy
  - (c) It gives BCD output
  - (d) It does not require a comparator
21. The minimum number of comparator required to build 8 bit flash ADC is
- (a) 8
  - (b) 63
  - (c) 255
  - (d) 256
22. The minimum number of 2:1 multiplexer required to realize a 4:1 multiplexer is
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
23. In digital electronics ECL Stands for:
- (a) Emitter Collector Logic
  - (b) Emitter Coupled Logic
  - (c) Electron Coupled Logic
  - (d) Electronics Cascading Logic
24. Operation carried out by a NOT gate are also termed as
- (a) inverting
  - (b) converting
  - (c) reverting
  - (d) reversing
25. The microprogram resides in
- (a) Main Memory
  - (b) Cache Memory
  - (c) Control Memory
  - (d) Register Memory
26. Which memory device is generally made of semi-conductors?
- (a) RAM
  - (b) Hard-disk
  - (c) Floppy disk
  - (d) Cd disk
27. The small extremely fast, RAM's are called as
- (a) Cache
  - (b) Heaps
  - (c) Accumulators
  - (d) Stacks
28. \_\_\_\_\_ is generally used to increase the apparent size of physical memory.
- (a) Secondary memory
  - (b) Virtual memory
  - (c) Hard-disk
  - (d) Disks
29. In case of, Zero-address instruction method the operands are stored in
- (a) Registers
  - (b) Accumulators
  - (c) Push down stack
  - (d) Cache

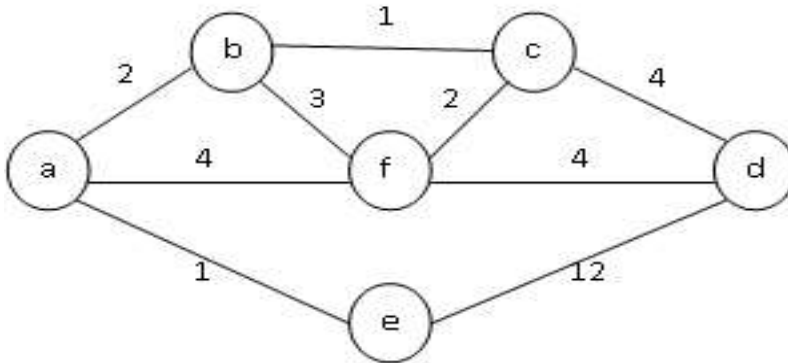
30. Add #45, when this instruction is executed the following happen/s
- (a) The processor raises an error and requests for one more operand
  - (b) The value stored in memory location 45 is retrieved and one more operand is requested
  - (c) The value 45 gets added to the value on the stack and is pushed onto the stack
  - (d) None of these
31. 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
32. In micro-programmed approach, the signals are generated by
- (a) Machine instructions
  - (b) System programs
  - (c) Utility tools
  - (d) None of these
33. A word whose individual bits represent a control signal is
- (a) Command word
  - (b) Control word
  - (c) Co-ordination word
  - (d) Generation word
34. Every time a new instruction is loaded into IR the output of \_\_\_\_\_ is loaded into UPC.
- (a) Starting address generator
  - (b) Loader
  - (c) Linker
  - (d) Clock
35. The drawback of building a large memory with DRAM is
- (a) The large cost factor
  - (b) The inefficient memory organisation
  - (c) The Slow speed of operation
  - (d) All of these
36. The fastest data access is provided using
- (a) Caches
  - (b) DRAM's
  - (c) SRAM's
  - (d) Registers
37. The computer architecture aimed at reducing the time of execution of instructions is
- (a) CISC
  - (b) RISC
  - (c) ISA
  - (d) ANNA
38. \_\_\_\_\_ is an extension of the processor BUS.
- (a) SCSI BUS
  - (b) USB
  - (c) PCI BUS
  - (d) None of these
39. ANSI stands for
- (a) American National Standards Institute
  - (b) Architectural National Standards Institute
  - (c) Asian National Standards Institute
  - (d) None of these
40. Which of these best describes an array?
- (a) A data structure that shows a hierarchical behaviour
  - (b) Container of objects of similar types
  - (c) Container of objects of mixed types
  - (d) All of these
41. How do you initialize an array in C?
- (a) `int arr[3] = (1,2,3);`
  - (b) `int arr(3) = {1,2,3};`
  - (c) `int arr[3] = {1,2,3};`
  - (d) `int arr(3) = (1,2,3);`

42. A linear collection of data elements where the linear node is given by means of pointer is called?  
(a) Linked list (b) Node list  
(c) Primitive list (d) None of these
43. In linked list each node contain minimum of two fields. One field is data field to store the data second field is?  
(a) Pointer to character (b) Pointer to integer  
(c) Pointer to node (d) Node
44. What differentiates a circular linked list from a normal linked list?  
(a) You cannot have the 'next' pointer point to null in a circular linked list  
(b) It is faster to traverse the circular linked list  
(c) You may or may not have the 'next' pointer point to null in a circular linked list  
(d) All of these
45. Which of the following application makes use of a circular linked list?  
(a) Undo operation in a text editor (b) Recursive function calls  
(c) Allocating CPU to resources (d) All of these
46. Which of the following is false about a circular linked list?  
(a) Every node has a successor  
(b) Time complexity of inserting a new node at the head of the list is  $O(1)$   
(c) Time complexity for deleting the last node is  $O(n)$   
(d) None of these
47. In linked list implementation of a queue, front and rear pointers are tracked. Which of these pointers will change during an insertion into a NONEMPTY queue?  
(a) Only front pointer (b) Only rear pointer  
(c) Both front and rear pointer (d) None of these
48. QuickSort can be categorized into which of the following?  
(a) Brute Force technique (b) Divide and conquer  
(c) Greedy algorithm (d) Dynamic programming
49. What is the worst case complexity of selection sort?  
(a)  $O(n \log n)$  (b)  $O(\log n)$   
(c)  $O(n)$  (d)  $O(n^2)$
50. What is the advantage of bubble sort over other sorting techniques?  
(a) It is faster (b) Consumes less memory  
(c) Detects whether the input is already sorted (d) All of these

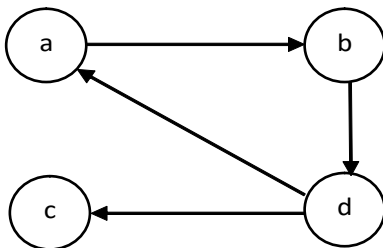
**SECTION - B (Short answer type question)**  
**(100 Marks)**

All questions carry equal marks of 5 each.

This Section should be answered only on the **Answer Sheet** provided.



1. For the above graph compute the minimum spanning tree using Prim's Algorithms
2. For the above graph compute the shortest path from node a to all nodes using Dijkstra's algorithm.
3. Using Warshal's algorithm Compute the transitive closure for the following digraph.



4. Design a full adder using NAND gates only.
5. Differentiate between PMOS and NMOS device.
6. Differentiate between RISC and CISC.
7. Multiply  $5A4D$  by  $2C$ .
8. Subtract  $(10100110)_2$  From  $(11010100101)_2$  using 2's complement method.
9. Multiply  $(11010100101)_2$  by  $(10100110)_2$ .
10. State the advantages of Pipelining architecture.
11. Explain the effective address generation for Relative Address mode .
12. Write a recursive algorithm to generate the factorial of an integer n.
13. State the Characteristics of Greedy algorithm.
14. Given an Integer array  $\{9,8,7,6,5,4,3,2,1\}$  sort using bubble sort.

15. Generate the address symbol table for the following program:

	ORG 100
	LDA SUB
	CMA
	INC
	ADD MIN
	STADIF
	HLT
MIN,	DEC 83
SUB,	DEC -23
DIF,	HEX 0
	END

16. Write the control word bit for the operation R1? R2 – R3.

17. Simplify the following Boolean expression:

$$F(a,b,c,d)=abc' + a'bc + acd + ab'c + bc'd + ab'd + abd'$$

18. Differentiate between Synchronous and Asynchronous I/O.

19. State the classifications of parallel processing devices.

10. Construct a NDFA for the following regular expression:  $(a?b)^*aba(a?b)^*$

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