

105/2024

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. The value of α for which the system of equations

$$x + y + z = 9$$

$$x - y + z = 5$$

$$2x + y + \alpha z = 9$$

is not consistent.

(A) 1

(B) 2

(C) 3

(D) 4

2. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ 2 & 1 & -1 \end{bmatrix}$, which of the following is true?

(A) $A^3 - 2A^2 - A - 2I = 0$

(B) $A^3 - 2A^2 - A - 3I = 0$

(C) $A^3 - 2A^2 - A + 3I = 0$

(D) $A^3 - 2A^2 - A + 2I = 0$

3. Which of the following matrices cannot be diagonalized?

(A) $\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$

(C) $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

4. The statement $(P \Rightarrow Q)$ is logically equivalent to :

(A) $(\neg(P \wedge (\neg Q)))$

(B) $(P \wedge (\neg Q))$

(C) $(\neg(\neg P \wedge \neg Q))$

(D) $(P \vee (\neg Q))$

5. Which of the following is not a tautology?

(A) $(A \Rightarrow B) \wedge (B \Rightarrow C) \Rightarrow (A \Rightarrow C)$

(B) $(A \Leftrightarrow B) \Leftrightarrow (\neg B \Leftrightarrow \neg A)$

(C) $((A \vee B) \wedge (\neg A)) \Rightarrow B$

(D) $A \wedge (A \Rightarrow B) \Rightarrow \neg B$

6. In an examination, the question paper consists of 15 questions divided into three parts A, B and C consisting of 4, 5 and 6 questions respectively. A student is required to answer 10 questions selecting atleast 3 from each part. Number of ways he can select the questions is :

(A) 1000

(B) 1200

(C) 600

(D) 400

A

3

[P.T.O.]

7. Number of four digit numbers which are divisible by 9 that can be formed using the digits 0, 2, 3, 6, 7, 9, if no digit is repeated :
- (A) 30 (B) 24
(C) 42 (D) 15
8. Number of positive integers ≤ 2000 which are divisible by 2 or 3 or 5 is :
- (A) 1466 (B) 1467
(C) 1468 (D) 1469
9. Consider the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2 + x - 2$ is :
- (A) Injective but not surjective (B) Surjective but not injective
(C) Neither injective nor surjective (D) Bijective
10. Let R be a relation on the set of natural numbers defined by $(a, b) \in R$ if and only if $a + b$ is a multiple of 5. Then, R is :
- (A) Reflexive but not symmetric (B) Symmetric and reflexive
(C) Transitive but not reflexive (D) Symmetric but not transitive
11. Number of subgroups of $(\mathbb{Z}_{12}, +)$ is :
- (A) 2 (B) 3
(C) 4 (D) 6
12. Let \mathbb{R}^* be the group of non zero real numbers under usual multiplication. Which of the following is a homomorphism from \mathbb{R}^* to \mathbb{R}^* ?
- (A) $f(x) = x + 1$ (B) $f(x) = 2x$
(C) $f(x) = \frac{1}{|x|}$ (D) $f(x) = -x$
13. Which of the following is always true?
- (A) Every ring has a multiplicative identity
(B) Every field has a multiplicative identity
(C) Every commutative ring has a multiplicative identity
(D) In a field, every element has a multiplicative inverse
14. Let G be a connected bipartite simple graph with 15 vertices. If the independence number is 10 then the edge independence number is :
- (A) 5 (B) 10
(C) 15 (D) 20

15. Which of the following is true?
- (A) K_5 is a planar graph
 - (B) $K_{3,3} - e$ is a planar graph for any edge e in $K_{3,3}$
 - (C) $K_{3,3}$ is a planar graph
 - (D) $K_{2,3}$ is a non planar graph
16. Let G be a simple graph with 12 vertices and degree of each vertex is 3. If k is the vertex connectivity and k' is the edge connectivity of G , which of the following is true?
- (A) $k < k'$
 - (B) $k' < k$
 - (C) $k = k'$
 - (D) $k + k' = 8$
17. The conversion character used as argument type for hexadecimal input data in C programming is :
- (A) e
 - (B) g
 - (C) x
 - (D) h
18. In C programming, which operator has highest precedence in $*$, $/$ and $\%$?
- (A) $*$
 - (B) $/$
 - (C) $\%$
 - (D) same precedence
19. What is the output of the following code?
- ```
#include <stdio.h>
void main ()
{
 int j=3, K ;
 K=! 4 && j ;
 printf("\nK=%d", K) ;
}
```
- (A)  $K=0$
  - (B)  $K=1$
  - (C) Error
  - (D) None of the above
20. Which of the following is not true?
- (A) A static member function can be called using the class name
  - (B) A static function can have access to other static members
  - (C) A static member function can be virtual
  - (D) None of the above
21. The feature that is not an Object Oriented Programming concept :
- (A) Dynamic binding
  - (B) Message passing
  - (C) Platform independent
  - (D) Data hiding

22. The ability to provide the operators with a special meaning is an example of :
- (A) Inheritance (B) Interface  
(C) Packages (D) Polymorphism
23. The macro substitution in a program are done :
- (A) After the compilation of the program  
(B) Before the compilation of the program  
(C) After the execution of the program  
(D) During the execution of the program
24. The ftell() function in C :
- (A) returns the current pointer position  
(B) returns the position of the beginning of the file  
(C) returns the position of the end of the file  
(D) none of the above
25. Which of the following is a valid identifier?
- (A) 3 VAR (B) VAR\_3@  
(C) 3\_VAR (D) VAR\_3
26. The data structure used to manage Recursion is :
- (A) Array (B) Tree  
(C) Queue (D) Stack
27. The symbol used to denote select operation in relational algebra is :
- (A)  $\sigma$  (B)  $\pi$   
(C)  $\cup$  (D) None of the above
28. Which among the following is not a constraint in SQL?
- (A) UNIQUE (B) UNION  
(C) CHECK (D) PRIMARY KEY
29. The number of entities to which another entity can be associated via a relationship set is :
- (A) Participation ratio (B) Attribute ratio  
(C) Cardinality ratio (D) None of the above
30. The Entity Relationship modelling technique is :
- (A) Bottom Up Approach (B) Top Down Approach  
(C) Left Right Approach (D) Right Left Approach
31. The functional dependency is a relationship that exists between or among :
- (A) Attributes (B) Records  
(C) Tables (D) Databases

32. The phase in which a transaction may release locks but may not obtain any new lock is :
- (A) Growing phase (B) Shrinking phase  
(C) Expanding phase (D) Granting phase
33. The characteristic equation of D flip flop is :
- (A)  $Q(t+1) = D'$  (B)  $Q(t+1) = D + D'$   
(C)  $Q(t+1) = D$  (D) None of the above
34. A computer has 128K of memory. How many bytes does this represent?
- (A) 131072 (B) 1024  
(C) 128000 (D) None of the above
35. The combinational circuit that compares two numbers and determines their relative magnitudes :
- (A) Binary Multiplier  
(B) Magnitude Multiplier  
(C) Magnitude Comparator  
(D) Binary Decoder
36. Given two binary numbers  $X = (1010100)_2$  and  $Y = (1000011)_2$ . What is the result of  $X - Y$  ?
- (A) 1010001 (B) 0010001  
(C) 0010010 (D) 0001001
37. The maximum number of unique output lines from a 4-input line decoder is:
- (A) 16 (B) 8  
(C) 4 (D) 2
38. If  $h$  is the hitratio of cache memory, what is the missratio?
- (A)  $h - 1$  (B)  $h + 1$   
(C)  $1 - h$  (D) None of the above
39. Which of the following statement is/are correct about addressing modes?
- (i) Direct addressing is a scheme in which the address specifies which memory word or register contains the operand.  
(ii) Indirect addressing is a scheme in which the address specifies which memory word or register contains the address of the operand.  
(iii) In register addressing, the address field contains the register number in which the operand is stored.
- (A) Only (i & ii) (B) Only (ii & iii)  
(C) Only (i & iii) (D) All of the above (i, ii, & iii)

40. The decimal equivalent of BCD code 010110000110 is :
- (A) 856 (B) 586  
(C) 658 (D) 568
41. The DMA transfer mode in which an entire block of data is transferred in one contiguous sequence is :
- (A) Burst Mode (B) Cycle stealing mode  
(C) Transparent mode (D) None of the above
42. The result of  $(83-16)$  in binary is :
- (A) 1010011 (B) 1001010  
(C) 1000011 (D) 1000010
43. The mechanism that uses hard disk as a part of the computers memory is :
- (A) Cache memory (B) Virtual memory  
(C) Primary memory (D) Register
44. The method used for prioritizing multiple interrupts is called :
- (A) Polling (B) Locality of reference  
(C) Daisy chaining (D) None of the above
45. The expansion of EAROM is :
- (A) Electrically Alterable ROM (B) Electrically Addressable ROM  
(C) Electrically Accessable ROM (D) None of the above
46. The instructions used to move data between the register pair HL and memory is :
- (A) RHL, MHL (B) LHL, SHL  
(C) BHL, PHL (D) AHL, FHL
47. How many full adders are required to construct an  $n$ -bit parallel adder :
- (A)  $n - 1$  (B)  $n + 1$   
(C)  $n - 2$  (D)  $n + 2$
48. What is the number of address lines used in IBM PC bus?
- (A) 10 Address lines (B) 16 Address lines  
(C) 20 Address lines (D) None of the above
49. The number of page faults produced by Least Recently Used (LRU) algorithm for the following reference string for a memory with three frames.  
2, 0, 3, 7, 0, 1, 0, 4, 2, 3, 3, 0, 2, 1, 2, 0, 7, 1, 0, 1
- (A) 10 (B) 11  
(C) 12 (D) 13

50. The degree of multiprogramming is decided by :
- (A) Long term scheduler (B) Short term scheduler  
(C) Medium term scheduler (D) None of the above
51. Belady's Anomaly points out that :
- (A) The page fault may increase as the number of allocated frames increases  
(B) The page fault may decrease as the number of allocated frames increases  
(C) The page fault may decrease as the number of allocated frames decreases  
(D) The page fault may increase as the number of allocated frames decreases
52. Which of the following is true in the case of 'Context Switch'?
- (i) Highly dependent on hardware support  
(ii) The system does no useful work while context switching  
(iii) Is saving the state of the current process and loading the saved state for the new process for switching the CPU to the new process
- (A) Only (ii) and (iii)  
(B) Only (i) and (ii)  
(C) Only (i) and (iii)  
(D) All the above
53. A scheduling algorithm which can be implemented as both Pre-emptive and Non Pre-emptive :
- (i) First Come First Served  
(ii) Round Robin  
(iii) Shortest Job First  
(iv) Priority Scheduling
- (A) Only (i) and (ii) (B) Only (ii) and (iii)  
(C) Only (iii) and (iv) (D) Only (i) and (iv)
54. Semaphore :
- (i) Is an integer that, apart from initialization can be accessed only through two standard atomic operation: wait and signal  
(ii) When one process modifies the semaphore value, the other process can simultaneously modify the same semaphore value
- (A) Only (i) is true  
(B) Only (ii) is true  
(C) Both (i) and (ii) are true  
(D) Neither (i) nor (ii) is true

55. A deadlock situation can arise if the following four conditions hold simultaneously in a system :
- (A) Circular wait, Pre-emption, Hold and wait, Mutual Exclusion
  - (B) Hold and Wait, Circular wait, No pre-emption, Mutual Exclusion
  - (C) Critical Section, Mutual Exclusion, Pre-emption, Circular wait
  - (D) Mutual Exclusion, Critical Section, No pre-emption, Hold and wait
56. Consider a logical address space of 8 pages of 2048 words each, mapped into a physical memory of 32 frames, the number of bits in the logical address and physical address are \_\_\_\_\_ and \_\_\_\_\_.
- (A) 23, 25
  - (B) 20, 20
  - (C) 3, 5
  - (D) 13, 15
57. Suppose the numbers 18, 25, 34, 12, 67, 23, 33, 69, 71, 48 are inserted in this order into a binary search tree. What is the pre-order traversal sequence of the resultant tree?
- (A) 12, 18, 23, 25, 33, 34, 48, 67, 69, 71
  - (B) 18, 12, 25, 23, 34, 33, 67, 48, 69, 71
  - (C) 12, 23, 33, 48, 71, 69, 67, 34, 25, 18
  - (D) 18, 25, 34, 12, 67, 23, 33, 69, 71, 48
58. Which of the following sequences, when stored in an array at locations  $A[0] \dots A[9]$  forms a max-heap?
- (A) 32, 23, 17, 18, 21, 14, 6, 8, 9, 20
  - (B) 32, 17, 23, 18, 21, 6, 8, 14, 9, 20
  - (C) 32, 23, 14, 17, 21, 18, 6, 8, 9, 20
  - (D) 32, 23, 17, 14, 21, 18, 6, 8, 9, 20
59. A circular queue is implemented using an array of size  $n$  and the pointers, front and rear points to the first and last element of the queue respectively. This circular queue is full when :
- (A)  $\text{front} = \text{rear} + 1$
  - (B)  $\text{rear} = \text{front} + 1$
  - (C)  $\text{rear} = (\text{front} + 1) \bmod n$
  - (D)  $\text{front} = (\text{rear} + 1) \bmod n$
60. Which of the following statement is false?
- (A) The intersection of two regular languages is regular
  - (B) The intersection of two context free languages is context free
  - (C) The intersection of two recursive languages is recursive
  - (D) The intersection of two recursively enumerable languages is recursively enumerable
61. When devices communicate using Bluetooth terminology, they use :
- (A) Radio Waves
  - (B) Infrared Waves
  - (C) Micro Waves
  - (D) Light Waves



62. Search Engines finds information from web using a program, called :
- (A) Cookies (B) Spider  
(C) Browser (D) Ant Colony
63. When a router connects devices to the internet, it assigns an identifier to each device, known as :
- (A) MAC address (B) URL address  
(C) IP address (D) TCP address
64. A network on the internet has a subnet mask of 255.255.248.0. What is the maximum number of hosts it can handle?
- (A) 1022 (B) 2046  
(C) 4094 (D) 8190
65. The hamming code word for the data word 1111001 if both the sender and receiver agrees with even parity is :
- (A) 11101001111 (B) 11101101111  
(C) 11111001110 (D) 11111001100
66. The average time complexity of quick sort algorithm is :
- (A)  $O(n^2)$  (B)  $O(n \log n)$   
(C)  $\theta(n^2)$  (D)  $\theta(n \log n)$
67. A repeater operates at \_\_\_\_\_ layer.
- (A) Physical Layer (B) Data Link Layer  
(C) Network Layer (D) Application Layer
68. Which of the following is false with regard to ISO/OSI reference layer?
- (A) Presentation Layer deals with data encryption  
(B) Physical Layer is handles transmission of raw bits over the communication channel  
(C) Transport Layer provides token management service  
(D) The task of flow control is done by data link layer
69. Which among the following is a private IP address?
- (A) 192.168.1.10 (B) 172.15.12.28  
(C) 192.160.1.10 (D) 172.12.15.28
70. When bread first search and depth first search of a graph are implemented, which of the following data structures are used respectively?
- (A) Stack, Queue (B) Queue, Stack  
(C) Stack, Stack (D) Queue, Queue

71. Yacc stands for :
- (A) Yet another compiler converter
  - (B) Yet any compiler compiler
  - (C) Yet another compiler compiler
  - (D) Yet any compiler converter
72. Which of the following is look aside LR parser?
- (A) LLR
  - (B) LR
  - (C) SLR
  - (D) SSR
73. Consider the grammar  $S \rightarrow AA; A \rightarrow bb; A \rightarrow cc$ . Which of the following is true about the language produced  $S$  ?
- (A)  $L = \{bbcc, bc bc, cbc b, ccbb\}$
  - (B)  $L = \{bbcc, bbbb, cccc, ccbb\}$
  - (C)  $L = \{bbbb, ccbb, cbc b, bc bc\}$
  - (D)  $L = \{bbcc, cccc, cbc b, bc bc\}$
74. A lexical analyser produces the following output :
- (A) An intermediate code
  - (B) A symbol table
  - (C) A stream of tokens
  - (D) A parse tree
75. Which of the following problems is solved by backtracking?
- (A) Travelling sales man's problem
  - (B) 0/1 Knapsack problem
  - (C) Fractional Knapsack problem
  - (D) Matrix chain multiplication problem
76. When recursive binary search method is implemented to find the key of 18 from an input array  $A = \{18, 28, 38, 48, 58, 68, 78\}$ , what is the level of recursion?
- (A) 1
  - (B) 2
  - (C) 3
  - (D) 4
77. A machine in which, there may be several possible next states for each input value and state is called :
- (A) Finite automata
  - (B) Deterministic
  - (C) Non deterministic
  - (D) Determinative
78. Which of the following cannot be accepted by DPDA?
- (A) The language of palindromes over the alphabet  $\{0,1\}$
  - (B) The languages that are not regular
  - (C) Deterministic context free languages
  - (D) All of the above
79. The maximum number of transitions that can be performed over a state in a DFA over the language  $L = \{a,b,c,d\}$ :
- (A) 2
  - (B) 4
  - (C) 8
  - (D) 16

80. Context Free grammar is :  
(A) Type 0 grammar (B) Type 1 grammar  
(C) Type 2 grammar (D) Type 3 grammar
81. In HTML how do we insert an image?  
(A) `</img src="image">` (B) `</img src="image"/>`  
(C) `` (D) None of these
82. What is port 80 used for?  
(A) Telnet (B) HTTP  
(C) FTP (D) DNS
83. Which one is not a valid datatype in XML?  
(A) Boolean (B) String  
(C) Float (D) Varchar
84. Which of the following is not the property of the CSS box model?  
(A) Length (B) Padding  
(C) Margin (D) Border
85. What is the keyword to declare a constant in JavaScript?  
(A) Constant (B) Const  
(C) Cons (D) None of these
86. In JSON syntax data is separated by :  
(A) Semicolon (B) Space  
(C) Braces (D) None of these
87. What is HTTP response code 200?  
(A) Timeout (B) Bad request  
(C) Success (D) Redirection
88. A socket address is a combination of :  
(A) IP address and Port number (B) Ethernet address and Slot number  
(C) IP address and Domain name (D) None of these
89. What is the key length of 3DES?  
(A) 56 bits (B) 62 bits  
(C) 128 bits (D) 168 bits
90. Which one is not an active attack?  
(A) Traffic analysis (B) Masquerade  
(C) Replay (D) None of these

91. This prevents either the sender or receiver from denying a transmitted message:  
(A) Nonrepudiation (B) DoS  
(C) Integrity (D) All of these
92. Public key cryptography is :  
(A) Hash (B) Symmetric  
(C) Asymmetric (D) None of these
93. The acronym "RSA" comes from :  
(A) Rivest-Shimer-Anderson (B) Rivest-Shamir-Adleman  
(C) Ritter-Shimer-Adleman (D) None of these
94. Which is a network authentication protocol designed by MIT?  
(A) RADIUS (B) NPAP  
(C) NAPM (D) KERBEROS
95. A digital signature certificate issued by certifying authority of India comes under :  
(A) IT Act 2002 (B) IT Act 2001  
(C) IT Act 2000 (D) None of these
96. Which one is an example of object-oriented middleware?  
(A) CORBA (B) JAVA-RMI  
(C) DCOM (D) All of these
97. Name a protocol that helps the computers clock times to be synchronized in a distributed system :  
(A) NTP (B) TSP  
(C) CTP (D) None of these
98. Endpoint for communication between two processes :  
(A) Port (B) Socket  
(C) Slot (D) All of these
99. Which is not an example of IaaS?  
(A) EC2 (B) Linode  
(C) GoGrid (D) Salesforce
100. A standard for user authentication and authorization between the service provider and an identity provider is  
(A) AAML (B) ASML  
(C) SAML (D) SIML
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**SPACE FOR ROUGH WORK**

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