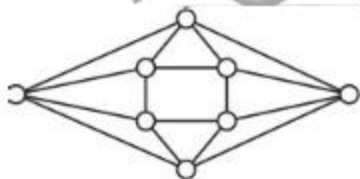


1. Consider the statement form $p \Rightarrow q$ where $p =$ "If Tom is Jane's father then Jane is Bill's niece" and $q =$ "Bill is Tom's brother." Which of the following statements is equivalent to this statement?
 - a) If Bill is Tom's Brother, then Tom is Jane's father and Jane is not Bill's niece
 - b) If Bill is not Tom's Brother, then Tom is Jane's father and Jane is not Bill's niece
 - c) If Bill is not Tom's Brother, then Tom is Jane's father or Jane is Bill's niece
 - d) If Bill is Tom's Brother, then Tom is Jane's father and Jane is Bill's niece
2. It is impossible for a valid argument to have true premises and...
 - a) A true conclusion
 - b) A negated conclusion
 - c) A conditional
 - d) A false conclusion
3. The four logical connectives are:
 - a) Conjunctions, conditionals, compounds, and disjunctions
 - b) Conjunctions, statements, disjunctions, and conditionals
 - c) Conditionals, disjunctions, negations, and conjunctions
 - d) Conjunctions, disjunctions, conditionals, and negations
4. Variance of binomial probability distribution is larger in value if:
 - a) q is greater than 0.5
 - b) p and q are equal
 - c) p and q are greater than 0.5
 - d) p is greater than 0.5
5. The range of binomial distribution is:
 - a) 0 to n
 - b) 0 to ∞
 - c) -1 to +1
 - d) 0 to 1
6. In a binomial experiment with three trials, the variable can take:
 - a) 2 values
 - b) 3 values
 - c) 4 values
 - d) 5 values

7. In octal, the twelve-bit two's complement of the hexadecimal I number 2AF is:
- 6523
 - 5261
 - 6251
 - 6521
8. What is the Cardinality of the Power set of the set $\{0, 1, 2\}$.
- 6
 - 7
 - 8
 - 9
9. The number of distinguishable permutations of the letters in the word BANANA are:
- 60
 - 36
 - 20
 - 10
10. If a brown sack consists of 4 white balls and 3 black balls then probability of one randomly drawn ball will be white is:
- $4/7$
 - $1/7$
 - $7/16$
 - $\%$
11. The minimum number of colours required to colour the following graph, such that no two adjacent vertices are assigned the same colour, is:



- 2
- 3
- 4
- 5

12. If all the edge weights of an undirected graph are positive, then any subset of edges that connects all the vertices and has minimum total weight is a:
- Hamiltonian cycle
 - Grid
 - Hypercube
 - Tree
13. In a connected graph, a bridge is an edge whose removal disconnects a graph. Which one of the following statements is True?
- A tree has no bridge
 - A bridge cannot be part of a simple cycle
 - Every edge of a clique with size ≥ 3 is a bridge (A clique is any complete subgraph of a graph)
 - A graph with bridges cannot have a cycle

14. Rank of the matrix A =

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 4 & 2 & 3 & 0 \\ 1 & 0 & 0 & 0 \\ 4 & 0 & 3 & 0 \end{bmatrix}$$

- 0
 - 1
 - 2
 - 3
15. The rank of a 3×3 matrix C (= AB), found by multiplying a non-zero column matrix A of size 3×1 and a non-zero row matrix B of size 1×3 , is:
- 0
 - 1
 - 2
 - 3
16. Sum of the perimeters of a circle and a square is 1. If sum of the area is least, then:
- side of the square is double the radius of circle
 - side of the square is $1/2$ of the radius of the circle
 - side of the square is equal to radius of the circle
 - None of the above

17. Mathematically, what is a differential?
- A gear box on the back end of your car
 - A word used a lot on a popular medical television series
 - A method of directly relating how changes in an independent variable affect changes in a dependent variable
 - A method of directly relating how changes in a dependent variable affect changes in an independent variable
18. For a 4-bit parallel adder, if the carry-in is connected to a logical HIGH, the result is:
- the same as if the carry-in is tied LOW since the least significant carry-in is ignored
 - that carry-out will always be HIGH
 - a one will be added to the final result
 - the carry-out is ignored
19. What about recursion is true in comparison with iteration?
- very expensive in terms of memory.
 - low performance.
 - every recursive program can be written with iteration too.
 - All of the above
20. Let G be a graph with n vertices and m edges. What is the tightest upper bound on the running time on Depth First Search of G ? Assume that the graph is represented using adjacency matrix:
- $O(n)$
 - $O(m+n)$
 - $O(n^2)$
 - $O(mn)$
21. Interpolation search is an improved variant of binary search. It is necessary for this search algorithm to work that:
- data collection should be in sorted form and equally distributed
 - data collection should be in sorted form and but not equally distributed
 - data collection should be equally distributed but not sorted
 - None of the above
22. Shell sort uses:
- Insertion sort
 - Merge sort
 - Quick sort
 - Selection sort

23. The SQL WHERE clause:
- limits the column data that are returned
 - limits the row data are returned
 - Both a) and b) are correct
 - Neither A nor B are correct
24. A recursive relationship is a relationship between an entity and _____.
- itself
 - a subtype entity
 - an archetype entity
 - an instance entity
25. Logical expression $(A \wedge B) \rightarrow (C \wedge A) \rightarrow (A \equiv 1)$ is:
- Contradiction
 - Valid
 - Well-formed formula
 - None of the above
26. In classification of probability distributions, 'Erlang distribution' is also called:
- alpha distribution
 - beta distribution
 - gamma distribution
 - exponential distribution
27. Let f is defined recursively by
 $f(0)=3$
 $f(n+1)=2f(n)+2$ Then $f(2)=$
- 8
 - 10
 - 18
 - 21
28. Which of the following pair is not congruent modulo 7?
- 10, 24
 - 25, 56
 - 31, 11
 - 64, -15

29. What is the Cartesian product of $A = \{1, 2\}$ and $B = \{a, b\}$?
- $\{(1, a), (1, b), (2, a), (b, b)\}$
 - $\{(1, 1), (2, 2), (a, a), (b, b)\}$
 - $\{(1, a), (2, a), (1, b), (2, b)\}$
 - $\{(1, 1), (a, a), (2, a), (1, b)\}$
30. Consider an undirected random graph of eight vertices. The probability that there is an edge between a pair of vertices is $1/2$. What is the expected number of unordered cycles of length three?
- $1/8$
 - 1
 - 7
 - 8
31. Consider the following two statements:
- The maximum number of linearly independent column vectors of a matrix A is called the rank of A .
 - If A is an $n \times n$ square matrix, it will be nonsingular if $\text{rank } A = n$.
- With reference to the above statements, which of the following applies?
- Both the statements are false
 - Both the statements are true
 - I is true but II is false
 - I is false but II is true
32. The system of linear equations
- $$(4d - 1)x + y + z = 0$$
- $$-y + z = 0$$
- $$(4d - 1)z = 0$$
- has a non-trivial solution, if d equals
- $1/2$
 - $1/4$
 - $3/4$
 - 1
33. The Generic Array Logic (GAL) device is _____.
- one-time programmable
 - reprogrammable
 - a CMOS device
 - reprogrammable and a CMOS device

34. Generally Dynamic RAM is used as main memory in a computer system as it _____.
- Consumes less power
 - has higher speed
 - has lower cell density
 - needs refreshing circuitry
35. Cache memory works on the principle of _____.
- Locality of data
 - Locality of memory
 - Locality of reference
 - Locality of reference & memory
36. Logic X-OR operation of (4AC0)H & (B53F)H results _____.
- AACB
 - 0000
 - FFFF
 - ABCD
37. _____ register keeps tracks of the instructions stored in program stored in memory.
- AR (Address Register)
 - XR (Index Register)
 - PC (Program Counter)
 - AC (Accumulator)
38. 'Aging registers' are _____
- Counters which indicate how long ago their associated pages have been referenced
 - Registers which keep track of when the program was last accessed
 - Counters to keep track of last accessed instruction
 - Counters to keep track of the latest data structures referred
39. Which one of the following is the tightest upper bound that represents the time complexity of inserting an object into a binary search tree of n nodes?
- $O(1)$
 - $O(\log n)$
 - $O(n)$
 - $O(n \log n)$

40. The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Which one of the following is the postorder traversal sequence of the same tree?
- 10, 20, 15, 23, 25, 35, 42, 39, 30
 - 15, 10, 25, 23, 20, 42, 35, 39, 30
 - 15, 20, 10, 23, 25, 42, 35, 39, 30
 - 15, 10, 23, 25, 20, 35, 42, 39, 30

41. What is the output of the following program?

```
#include<stdio.h>
main()
{
int i = 1;
while( i++<=5 )
printf("%d ",i++);
}
```

- 1 3 5
 - 2 4
 - 2 4 6
 - 2
42. The wildcard in a WHERE clause is useful when?
- An exact match is necessary in a SELECT statement
 - An exact match is not possible in a SELECT statement
 - An exact match is necessary in a CREATE statement
 - An exact match is not possible in a CREATE statement
43. To sort the results of a query use:
- SORT BY
 - GROUP BY
 - ORDER BY
 - None of the above
44. Let $N = \{1, 2, 3, \dots\}$ be ordered by divisibility, which of the following subset is totally ordered?
- (2, 6, 24)
 - (3, 5, 15)
 - (2, 9, 16)
 - (4, 15, 30)

45. What is the cardinality of the set of odd positive integers less than 10?
- 3
 - 5
 - 10
 - 20
46. Which of the following statements applies to the bisection method used for finding roots of functions?
- Converges within a few iterations
 - Guaranteed to work for all continuous functions
 - Is faster than the Newton-Raphson method
 - Requires that there be no error in determining the sign of the function
47. Newton-Raphson method of solution of numerical equation is not preferred when:
- Graph of $A(B)$ is vertical
 - Graph of $x(y)$ is not parallel
 - The graph of $f(x)$ is nearly horizontal-where it crosses the x-axis
 - None of the above
48. Following are the values of a function $y(x) : y(-1) = 5, y(0) = 8, y(1) = 8$
dy/dx at $x = 0$ as per Newton's central difference scheme is:
- 0
 - 1.5
 - 2.0
 - 3.0
49. Newton-Raphson method is applicable to the solution of:
- Both algebraic and transcendental Equations
 - Both algebraic and transcendental and also used when the roots are complex
 - Algebraic equations only
 - Transcendental equations only
50. If $f(x) = |x|$, then for interval $[-1, 1]$, $f(x)$
- satisfied all the conditions of Rolle's Theorem
 - satisfied all the conditions of Mean Value Theorem
 - does not satisfied the -conditions of Mean Value Theorem
 - None of the above

51. $G(d)$ was determined to be $3d + C$; here, C is called:
- the constant of differentiation
 - the constant of anti-differentiation
 - the constant of integration
 - the constant of death and taxes
52. Consider a hash table with 9 slots. The hash function is $h(k) = k \bmod 9$. The collisions are resolved by chaining. The following 9 keys are inserted in the order: 5, 28, 19, 15, 20, 33, 12, 17, 10. The maximum, minimum, and average chain lengths in the hash table, respectively, are:
- 3, 0, and 1
 - 3, 3, and 3
 - 4, 0, and 1
 - 3, 0, and 2

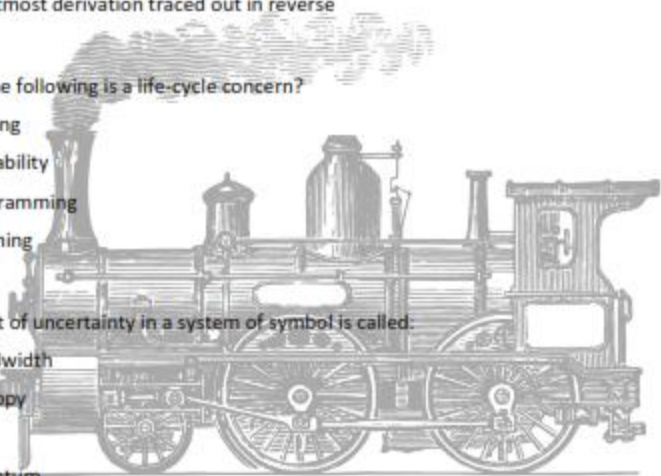
53. Consider the following operation along with Enqueue and Dequeue operations on queues, where k is a global parameter

```
MultiDequeue(Q){
  m = k
  while (Q is not empty and m > 0) {
    Dequeue(Q)
    m = m - 1
  }
}
```

What is the worst case time complexity of a sequence of n MultiDequeue() operations on an initially empty queue?

- $\Theta(n)$
 - $\Theta(n + k)$
 - $\Theta(nk)$
 - $\Theta(n^2)$
54. Let P be a Quick Sort Program to sort numbers in ascending order using the first element as pivot. Let t_1 and t_2 be the number of comparisons made by P for the inputs $\{1, 2, 3, 4, 5\}$ and $\{4, 1, 5, 3, 2\}$ respectively. Which one of the following holds?
- $t_1 = 5$
 - $t_1 < t_2$
 - $t_1 > t_2$
 - $t_1 = t_2$

55. In some programming languages, an identifier is permitted to be a letter followed by any number of letters or digits. If L and D denotes the sets of letters and digits respectively, which of the following expressions define an identifier?
- $(LUD)^*$
 - $L(LUD)^*$
 - $(L.D)^*$
 - $L.(L.D)^*$
56. Which of the following derivation a top-down parser use while parsing an input string? The input is assumed to be scanned in left to right order?
- Leftmost derivation
 - Leftmost derivation traced out in reverse
 - Rightmost derivation
 - Rightmost derivation traced out in reverse
57. Which of the following is a life-cycle concern?
- Testing
 - Portability
 - Programming
 - Planning
58. The amount of uncertainty in a system of symbol is called:
- Bandwidth
 - Entropy
 - Loss
 - Quantum
59. Poll/select line discipline requires _____ to identify the packet recipient?
- Timer
 - Buffer
 - Address
 - Dedicated line



60. Consider the following set of processes, with the arrival times and the CPU-burst times given in milliseconds

Process	Arrival Time	Burst Time
P1	0	5
P2	1	3
P3	2	3
P4	4	1

What is the average turnaround time for these processes with the preemptive shortest remaining processing time first (SRPT) algorithm?

- a) 5.50
b) 5.75
c) 6.00
d) 6.25
61. A uni-processor computer system only has two processes, both of which alternate 10ms CPU bursts with 90ms I/O bursts. Both the processes were created at nearly the same time. The I/O of both processes can proceed in parallel. Which of the following scheduling strategies will result in the least CPU utilization (over a long period of time) for this system?
- a) First come first served scheduling
b) Shortest remaining time first scheduling
c) Static priority scheduling with different priorities for the two processes
d) Round robin scheduling with a time quantum of 5 ms
62. An application loads 100 libraries at start-up. Loading each library requires exactly one disk access. The seek time of the disk to a random location is given as 10 ms. Rotational speed of disk is 6000 rpm. If all 100 libraries are loaded from random locations on the disk, how long does it take to load all libraries? (The time to transfer data from the disk block once the head has been positioned at the start of the block may be neglected):
- a) 0.50 s
b) 1.50 s
c) 1.25 s
d) 1.00 s

63. A CPU generally handles an interrupt by executing an interrupt service routine:
- a) As soon as an interrupt is raised
b) By checking the interrupt register at the end of fetch cycle
c) By checking the interrupt register after finishing the execution of the current instruction
d) By checking the interrupt register at fixed time intervals

64. Given the language $L = \{ab, aa, baa\}$, which of the following strings are in L^* ?

- 1) abaabaaabaa
- 2) aaaabaaaa
- 3) baaaaabaaaab
- 4) baaaaabaa

- a) 1, 2 and 3
- b) 2, 3 and 4
- c) 1, 2 and 4
- d) 1, 3 and 4

65. Let w be any string of length n is $\{0,1\}^*$. Let L be the set of all substrings of w . What is the minimum number of states in a non-deterministic finite automaton that accepts L ?

- a) $n-1$
- b) n
- c) $n+1$
- d) $2n-1$

66. The coupling between different modules of a software is categorized as follows:

- I. Content coupling
- II. Common coupling
- III. Control coupling
- IV. Stamp coupling
- V. Data coupling

Coupling between modules can be ranked in the order of strongest (least desirable) to weakest (most desirable) as follows:

- a) I-II-III-IV-V
- b) V-IV-III-II-I
- c) I-III-V-II-IV
- d) IV-II-V-III-I

67. Which of the following statements are TRUE?

- I. The context diagram should depict the system as a single bubble.
- II. External entities should be identified clearly at all levels of DFDs.
- III. Control information should not be represented in a DFD.
- IV. A data store can be connected either to another data store or to an external entity.

- a) II and III
- b) II and III
- c) I and III
- d) I, II and III

68. In the IPv4 addressing format, the number of networks allowed under Class C addresses is:
- 2^{14}
 - 2^7
 - 2^{21}
 - 2^{24}
69. Assume that the bandwidth for a TCP connection is 1048560 bits/sec. Let α be the value of RTT in milliseconds (rounded off to the nearest integer) after which the TCP window scale option is needed. Let β be the maximum possible window size with window scale option. Then the values of α and β are:
- 63 milliseconds and 65535×2^{14}
 - 63 milliseconds and 65535×2^{16}
 - 500 milliseconds and 65535×2^{14}
 - 500 milliseconds and 65535×2^{16}
70. Identify the correct order in which a server process must invoke the function calls accept, bind, listen, and recv according to UNIX socket API:
- listen, accept, bind, recv
 - bind, listen, accept, recv
 - bind, accept, listen, recv
 - accept, listen, bind, recv
71. The International Date Line is not a straight line because:
- The relief is uneven
 - The eastern and western hemispheres cannot have the same dates
 - One country cannot have different dates on the same day
 - It marks the boundary between the eastern and western hemispheres
72. Which of the following is not a mixture?
- Air
 - Sea water
 - Soil
 - Diamond
73. In the Ganga valley rainfall decreases from:
- West to east and north to south
 - West to east and south to north
 - East to west and north to south
 - East to west and south to north
74. The Great Plain of North India is a _____ plain.
- Aggradational
 - Till
 - Abysal
 - Erosional

75. The earth's gravitational field intensity is maximum at the:

- a) centre of the earth
- b) Pole
- c) Equator
- d) None of the above

76. The statute mile is equal to:

- a) 1460 yards
- b) 1560 yards
- c) 1660 yards
- d) 1760 yards

77. On moon what is the colour of the sky at daytime:

- a) Blue
- b) Orange
- c) Black
- d) Red

78. Humidity in the air is measured by:

- a) Hydrometer
- b) Hygrometer
- c) Opismeter
- d) Barometer

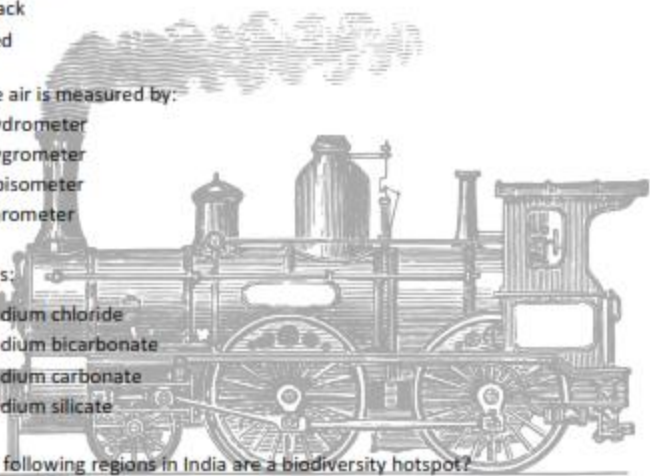
79. Washing soda is:

- a) Sodium chloride
- b) Sodium bicarbonate
- c) Sodium carbonate
- d) Sodium silicate

80. Which of the following regions in India are a biodiversity hotspot?

1. Western Ghats
2. Eastern Ghats
3. Eastern Himalayas
4. Western Himalayas

- a) 1 & 2
- b) 1 & 3
- c) 1,2 &3
- d) 2 &4



81. When was the Khalsa Panth established?

- a) 1615
- b) 1688
- c) 1699
- d) 1700

82. Night vision devices use which type of waves

- a) Radio waves
- b) microwaves
- c) Infrared light
- d) Ultraviolet light

83. Who among the following reformers is associated with the abolition of Sati ?

- a) Raja Rammohun Roy
- b) Iswarchandra Vidyasagar
- c) Keshab Chandra
- d) Dayanand Saraswati

84. Which of the following states/Union territories in India do/does not have scheduled castes?

1. Punjab 2. Lakshadweep 3. West Bengal 4. Nagaland

- a) 1 and 2
- b) 2 and 4
- c) 1 only
- d) 1,2 and 3

85. Which of the following Union territory does not have its own legislative assembly?

- a) Delhi
- b) Puducherry
- c) Chandigarh
- d) None of the above

86. India's rank in Human Capital Index (2016) is:

- a) 110th
- b) 150th
- c) 105th
- d) 85th

87. ISRO successfully launched PSLV-C28 carrying:

- a) Six British Satellites
- b) Seven British Satellites
- c) Five British Satellites
- d) Ten British Satellites

88. After independence, which city became the Capital of Punjab?
- Ludhiana
 - Amritsar
 - Shimla
 - Patiala
89. Jalandhar city is famous for which of the following industry?
- Sports Goods Manufacturing
 - Cycle Parts Industry
 - Information Technology
 - Electronics
90. The only stock exchange of Punjab is located in city:
- Chandigarh
 - Ludhiana
 - Amritsar
 - Hoshiarpur
91. The terms 'Shishu', 'Kishore' and 'Tarun' are associated with:
- SIDBI
 - MUDRA Yojna
 - Handloom Enterprises
 - None of the above
92. The Government of India has established NITI Aayog to replace the:
- Human Rights Commission
 - Finance Commission
 - Planning Commission
 - Law Commission
93. Which of the following is not a fundamental right under Indian Constitution?
- Right to free and compulsory education
 - Right to food
 - Right to freedom of Religion
 - Right to liberty
94. Article 368 of the Constitution of India deals with:
- The powers of the Parliament of India to amend the Constitution
 - Financial emergency
 - Reservation of seats SCs and STs in the Lok Sabha
 - Official language of the Union of India

95. Which article lays down Constitutional remedies for enforcement of Fundamental rights?

- a) Article 32
- b) Article 19
- c) Article 24
- d) Article 21

96. The 8th BRICS Summit (2016) was held in:

- a) Delhi
- b) Pune
- c) Bombay
- d) Goa

97. The concept of Public Interest litigation originated in:

- a) United Kingdom
- b) The United States
- c) Australia
- d) Canada

98. Article 370 provides for special provisions with respect to which of the following states:

- a) Andhra Pradesh
- b) Jammu & Kashmir
- c) Nagaland
- d) Assam

99. Who among the following has been awarded the Magsaysay Award 2016?

- a) Anshu Gupta
- b) Sanjiv Chaturvedi
- c) Kyaw Thu
- d) Bezwada Wilson

100. World Water Day is celebrated every year on:

- a) March 22
- b) April 3
- c) May 16
- d) June 23
