Answer Key :Computer Science & Engg.

Type: Computer Science & Engg.

1) Consider a set with n elements. Find the match for A1, A2, A3, A4 in B1, B2, B3, B4 where

A1	Number of possible relations that are symmetric	B1	$2^{n(n-1)/2}$
A2	Number of possible relations that are antisymmetric	B2	$2^{n(n+1)/2}$
A3	Number of possible relations that are irreflexive	B3	$2^n 3^{n(n-1)/2}$
A4	Number of possible relations that are reflexive and symmetric	B4	$2^{n(n-1)}$

Options:

- 1.A1-B2, A2-B3, A3-B4, A4-B1
- 2.A1-B3, A2-B2, A3-B1, A1-B4
- 3.A1-B1, A2-B2, A3-B3, A1-B4
- 4.A1-B4, A2-B1, A3-B2, A1-B3

Correct Option: 1

Type: Computer Science & Engg.

2) Determine truthness of the following statements and report S1-S2-S3

S1	The degree sequence of a graph is the sequence of the degrees of the vertices of the graph in nonincreasing order. Number of edges for a graph having its degree sequence as 5, 2, 2, 2, 2, 1 is 8
S2	Number of nonisomorphic connected bipartite simple graphs with four vertices is 3.
S3	Chromatic number of a graph is less than or equal to n – i - 1, where n is the number of vertices in the graph and i is the independence number of this graph. (The independence number of a graph is the maximum number of vertices in an independent set of vertices for the graph.)

Options:

- 1.False-True-False
- 2.True-False-False
- 3.True-True-True
- 4.False-False-False

Correct Option: 1

Type: Computer Science & Engg.

3) Smallest number of people you need to choose at random so that the probability that at least one of them has a

birthday today exceeds 1⁄2 is

Options:

- 1.614
- 2.183
- 3.365
- 4.253

Correct Option: 4

Type: Computer Science & Engg.

4) What is the output of the C code below

```
#include <stdio.h>
int main() {
    int a = 10, b = 5;
    int result = ++a * b-- - a++ + --b;
    printf("%d\n", result);
    return 0;
}
```

Options:

- 1.44
- 2.45
- 3.47
- 4.None of these

Correct Option: 3

Type: Computer Science & Engg.

5) Which of the following statements about Selection Sort and Bubble Sort is incorrect?

```
#include <stdio.h>
int compute(int x, int y) {
    return (x > y) ? (x - y) : (x + y);
}

int main() {
    int a = 4, b = 8, c = 6;
    int result = compute(a, b) + compute(b, c) - compute(c, a);
    printf("%d\n", result);
    return 0;
}
```

Options:

- 1.Both Selection Sort and Bubble Sort have a worst-case time complexity of O(n^2)
- 2.Selection Sort is an in-place algorithm, meaning it doesn't require extra memory for sorting.
- 3.Bubble Sort is more efficient than Selection Sort for large data sets.

- 4.Both Selection Sort and Bubble Sort are comparison-based sorting algorithms.

Correct Option: 3

Type: Computer Science & Engg.

6) What is virtual memory?

Options:

- 1.Memory allocated by the operating system for temporary use
- 2.Memory that simulates the entire computer memory using the hard disk
- 3.Memory allocated for cache and buffer management
- 4.Memory that cannot be accessed directly by users

Correct Option: 2

Type: Computer Science & Engg.

7) What is the output of the C code below

```
#include <stdio.h>
int compute(int x, int y) {
    return (x > y) ? (x - y) : (x + y);
}

int main() {
    int a = 4, b = 8, c = 6;
    int result = compute(a, b) + compute(b, c) - compute(c, a);
    printf("%d\n", result);
    return 0;
}
```

Options:

- 1.6
- 2.12
- 3.24
- 4.None of these

Correct Option: 2

Type: Computer Science & Engg.

8) What is the output of the C code below

```
#include <stdio.h>

void modify(int *x, int *y) {
    while (*y != 0) {
        *x = *x % *y;
        *x ^= *y ^= *x ^= *y;
    }
}

int main() {
    int a = 21, b = 15;
    int *p = &a, *q = &b;

    modify(p, q);

    printf("%d\n", a);
    return 0;
}
```

Options:

- 1.5
- 2.3
- 3.10
- 4.none of these

Correct Option: 2

Type: Computer Science & Engg.

9) Consider a binary tree with n nodes, where each node can have at most two children. The height of the tree is defined as the maximum number of edges between the root node and any leaf node. Which of the following statements is true regarding the height h of this binary tree?

Options:

- 1.The height of the tree is always equal to n-1.
- 2.The height of the tree can be greater than or equal to n-1.
- 3.The height of the tree is always equal to $\log_2(n)$.
- 4.The height of the tree can be greater than or equal to $\log_2(n)$.

Correct Option: 4

Type: Computer Science & Engg.

10) Boolean function F is called self-dual if and only if

$F(x_1, x_2, \ldots, x_n) = \neg F(\neg x_1, \neg x_2, \ldots, \neg x_n)$

Consider following four function and find which self dual are

A1	$F(x,y) = x$
A2	$F(x,y) = xy + \neg x \neg y$
A3	$F(x,y) = x + y$
A4	$F(x,y) = xy + \neg x y$

Options:

- 1.A1, A4
- 2.A1, A2, A3
- 3.A2, A3, A4
- 4.All of these

Correct Option: 1

Type: Computer Science & Engg.

11) Consider following functions from integer to real number, determine their correct order of asymptotic complexity.

Options:

- 1. $log_2 n$, 10, $\sqrt{n}$, n, $100/n$
- 2. $100/n$, 10, $log_2 n$, $\sqrt{n}$, n
- 3. $log_2 n$, $\sqrt{n}$, n, $100/n$, 10
- 4. $100/n$, 10, $log_2 n$, $\sqrt{n}$, n

Correct Option: 2

Type: Computer Science & Engg.

12) Which one of the following represents the language generated by the grammar?

Consider the following context-free grammar over the alphabet $\Sigma = \{a, b, c\}$ with S as the start symbol:

$S \rightarrow abScT \mid abcT$

$T \rightarrow bT \mid b$

Options:

- 1. $\{(ab)^n (cb)^n \mid n \geq 1\}$
- 2. $\{(ab)^n cb^{m1} cb^{m2} \ldots cb^{mn} \mid n, m1, m2, \ldots, mn \geq 1\}$
- 3. $\{(ab)^n (cb)^m \mid m, n \geq 1\}$
- 4. $\{(ab)^n (cb^n)^m \mid m, n \geq 1\}$

Correct Option: 3

Type: Computer Science & Engg.

13) Let T be a tree with 13 vertices then sum of degree of all the vertices is

Options:

- 1.26
- 2.24
- 3.78
- 4.none of these

Correct Option: 2

Type: Computer Science & Engg.

14) Let A="qpqrr", B="pqprqrp" Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B, and let y be the number of such longest common subsequences between A and B. Then x+10y is

Options:

- 1.41
- 2.42
- 3.43
- 4.44

Correct Option: 4

Type: Computer Science & Engg.

15) What is the probability that a randomly chosen positive integer from 1 to 100 (both inclusive) is not divisible by 2, 3, or 5?

Options:

- 1.0.45
- 2.0.5
- 3.0.55
- 4.None of these

Correct Option: 3

Type: Computer Science & Engg.

16) Consider a main memory system that consists of 8 memory modules attached to the system bus, which is one word wide. When a write request is made, the bus is occupied for 100 nanoseconds (ns) by the data, address, and control signals. During the same 100 ns, and for 500 ns thereafter, the addressed memory module executes one cycle accepting and storing the data. The (internal) operation of different memory modules may overlap in time, but only one request can be on the bus at any time. The maximum number of stores (of one word each) that can be initiated in 1 millisecond is

Options:

- 1.10000
- 2.12000
- 3.15000
- 4.20000

Correct Option: 1

Type: Computer Science & Engg.

17) Which one of the following options correctly determines the solution of the recurrence relation T(n) = 2T(n/2) + log n with T(1) = 1?

Options:

- 1. $\Theta(n)$
- 2. $\Theta(n \log n)$
- 3. $\Theta(n^2)$

- 4. $\Theta(\log n)$

Correct Option: 1

Type: Computer Science & Engg.

18) Consider a 512 GB hard disk with 32 storage surfaces. There are 4096 sectors per track and each sector holds 1024 bytes of data. The number of cylinders in the hard disk is:

Options:

- 1.512
- 2.1024
- 3.2048
- 4.4096

Correct Option: 4

Type: Computer Science & Engg.

19) The worst-case running time to search for an element in a balanced binary search tree with n^{2^n} elements is:

Options:

- 1. $\Theta(n \log n)$
- 2. $\Theta(n2^n)$
- 3. $\Theta(n)$
- 4. $\Theta(\log n)$

Correct Option: 1

Type: Computer Science & Engg.

20) Given the basic ER and relational models, which of the following is INCORRECT?

Options:

- 1.An attribute of an entity can have more than one value
- 2.An attribute of an entity can be composite
- 3.In a row of a relational table, an attribute can have more than one value
- 4.In a row of a relational table, an attribute can have exactly one value or a NULL

Correct Option: 3

Type: Computer Science & Engg.

21) In an unweighted, undirected connected graph, the shortest path from a node S to every other node is computed most efficiently, in terms of time complexity, by

Options:

- 1.Dijkstra's algorithm starting from S.
- 2.Warshall's algorithm.
- 3.performing a DFS starting from S.
- 4.performing a BFS starting from S.

Correct Option: 4

Type: Computer Science & Engg.

22) A virtual memory system uses First In First Out (FIFO) page replacement policy and allocates a fixed number of frames to a process. Consider the following statements:[P: Increasing the number of page frames allocated to a process sometimes increases the page fault rate. ; Q: Some programs do not exhibit locality of reference. ;] Which one of the following is TRUE?

Options:

- 1.Both P and Q are true, and Q is the reason for P.
- 2.Both P and Q are true, but Q is not the reason for P.
- 3.P is false, but Q is true.
- 4.Both P and Q are false.

Correct Option: 2

Type: Computer Science & Engg.

23) The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet?

Options:

- 1.62 subnets and 262142 hosts.
- 2.64 subnets and 262142 hosts.
- 3.62 subnets and 1022 hosts.
- 4.64 subnets and 1024 hosts.

Correct Option: 3

Type: Computer Science & Engg.

24) The minimum number of JK flip-flops required to construct a synchronous counter with the count sequence (0,0,1,1,2,2,3,3,0,0,...) is

Options:

- 1.one
- 2.two
- 3.three
- 4.four

Correct Option: 2

Type: Computer Science & Engg.

25) Consider two decision problems Q1, Q2 such that Q1 reduces in polynomial time to 3-SAT and 3-SAT reduces in polynomial time to Q2. Then which one of the following is consistent with the above statement?

Options:

- 1.Q1 is in NP, Q2 is NP-hard.
- 2.Q2 is in NP, Q1 is NP-hard.
- 3.Both Q1 and Q2 are in NP.
- 4.Both Q1 and Q2 are NP-hard.

Correct Option: 1

Type: Computer Science & Engg.

26) Consider the following array of elements. (89, 19, 50, 17, 12, 15, 2, 5, 7, 11, 6, 9, 100) The minimum number of interchanges needed to convert it into a max-heap is

Options:

- 1.4
- 2.5
- 3.2
- 4.3

Correct Option: 4

Type: Computer Science & Engg.

27) Assume that a quicksort algorithm, in the worst-case scenario, takes 15 seconds to sort an array of size 32. Which of the following most closely approximates the maximum input size of an array that can be sorted in 2 minutes in the worst-case scenario?

Options:

- 1.128
- 2.256
- 3.512
- 4.1024

Correct Option: 2

Type: Computer Science & Engg.

28) Let the page fault service time be 10 ms in a computer with average 1000000 memory access time being 20 ns. If one page fault is generated for every memory accesses, what is the effective access time for the memory?

Options:

- 1.21 ns
- 2.30 ns
- 3.23 ns
- 4.35 ns

Correct Option: 2

Type: Computer Science & Engg.

29) Consider a relation R(A, B, C, D, E) with the following three functional dependencies. AB → C; BC → D; C → E; The number of superkeys in the relation R is

Options:

- 1.2
- 2.4
- 3.8
- 4.12

Correct Option: 3

Type: Common

30) Which one of the following belongs to the category of homogeneous data

Options:

- 1.Multi-storeyed houses in a colony
- 2.Trees in a garden
- 3.Vehicular traffic on a highway
- 4.Student population in a class

Correct Option: 1

Type: Common

31) Following incomplete series is presented. Find out the number which should come at the place of question mark which will complete the series 4, 16, 36, 64,?

Options:

- 1.200
- 2.300
- 3.100
- 4.150

Correct Option: 3

Type: Common

32) In the absence of covariance among securities in the portfolio, if each security has an average standard deviation of 20%, the portfolio of 100 securities would have a standard deviation of

Options:

- 1.0.02
- 2.0.2
- 3.0.05
- 4.Zero

Correct Option: 1

Type: Common

33) In a certain code, 'bi nie pie' means 'some good jokes', 'nie bat lik' means 'some real stories', and 'pie lik tol' means 'many good stories'. Which word in that code means 'jokes'?

Options:

- 1.bi
- 2.nie
- 3.pie
- 4.None of the above

Correct Option: 1

Type: Common

34) 'Demonstrator' is related to 'Laboratory' in the same way as 'Leader' is related to

Options:

- 1.Podium
- 2.Assembly
- 3.Country
- 4.State

Correct Option: 2

Type: Common

35) A variable that is presumed to cause a change in another variable is called

Options:

- 1.A categorical variable
- 2.A dependent variable
- 3.An independent variable
- 4.An intervening variable

Correct Option: 3

Type: Common

36) The research design is

Options:

- 1.A common method adopted by all researchers to carry out research
- 2.The final choice between using qualitative or quantitative methods.
- 3.Presentation of research findings
- 4.A framework for every stage of the data collection and its analysis

Correct Option: 4

Type: Common

37) A technique of building up a list or a sample of a special population by using an initial set of members as informants is called

Options:

- 1.Quota sampling
- 2.Convenience sampling
- 3.Snowball sampling,
- 4.Purposive sampling

Correct Option: 3

Type: Common

38) In the context of Data Mining, which one of the following is a method of Data Reduction?

Options:

- 1.Data Compression
- 2.Multiple Regression
- 3.Normalization
- 4.Outlier Analysis

Correct Option: 1

Type: Common

39) A hypothesis can be described as

Options:

- 1.Just as a hunch
- 2.A wild guess
- 3.A type of statement made by researchers when they are attempting to get funding for their research
- 4. A prediction of some sort regarding the possible outcomes of a study

Correct Option: 4

Type: Common

40) Which scheme on performance and credit rating has been launched by Union MSME Ministry to assess the credit worthiness and capabilities of industries in the sector?

Options:

- 1.Zero Defect Scheme
- 2.Certification Performance and Economy Rating Scheme
- 3.Performance and Credit Rating Scheme
- 4.Industrial Incentive Scheme

Correct Option: 3

Type: Common

41) Interlocking of two or more types of food chains at different trophic levels is called

Options:

- 1.Food chain
- 2.Food web
- 3.Succession
- 4.Ecological pyramid

Correct Option: 2

Type: Common

42) A by-product of fossil fuel combustion is carbon dioxide. Which of the following is the cleanest with respect to the release of carbon dioxide?

Options:

- 1.Coal
- 2.Oil
- 3.Wood
- 4.Natural gas

Correct Option: 4

Type: Common

43) Maintaining balance between fulfilment of human needs and protection of environment is termed as

Options:

- 1.Environmental development
- 2.Sustainable development
- 3.Economic development
- 4.None of the above

Correct Option: 2

Type: Common

44) Identify the main Principle on which the Parliamentary System operates.

Options:

- 1.Responsibility of Executive to Legislature
- 2.Supremacy of Parliament
- 3.Supremacy of Judiciary
- 4.Theory of Separation of Power

Correct Option: 1

Type: Common

45) A 280 m train is moving at a speed of 80 kmph. How much time will it take to pass a bridge that is 120 m long?

Options:

- 1.30 s
- 2.32 s
- 3.18 s
- 4.40 s

Correct Option: 3

Type: Common

46) A, B, C, D and E are sitting on a bench. A is sitting next to B; C is sitting next to D, and D is not sitting with E who is on the left end of the bench. C is on the second position from the right. A is to the right of B and E. A and C are sitting together. In which position A is sitting?

Options:

- 1.Between B and D
- 2.Between B and C
- 3.Between E and D
- 4.Between C and E

Correct Option: 2

Type: Common

47) If all the letters in the word 'ARGUMENT' are rearranged in alphabetical order and substituted by the letter immediately following it in English alphabet, then what will be the new arrangement of letters?

Options:

- 1.BFHNOSUV
- 2.BFHONSWV
- 3.BFHNOUSV
- 4.BFHNOQUV

Correct Option: 1

Type: Common

48) Find the odd pair of words

Options:

- 1.Room : House

- 2.Atom : Electron
- 3.Car : Engine
- 4.Milk : Water

Correct Option: 1

Type: Common

49) Vinita, who is the sister-in-law of Amit, is the daughter-in-law of Kamni. Deepak is the father of Sandy who is the only brother of Amit. How is Kalyani related to Ashok?

Options:

- 1.Mother-in-law
- 2.Aunt
- 3.Wife
- 4.None of the above

Correct Option: 4

Type: Computer Science & Engg.

50) There are n stations in a slotted LAN. Each station attempts to transmit with a probability p in each time slot. What is the probability that ONLY one station transmits in a given time slot?

Options:

- 1. $np(1-p)^{(n-1)}$
- 2. $(1-p)^{(n-1)}$
- 3. $p(1-p)^{(n-1)}$
- 4. $1-(1-p)^{(n-1)}$

Correct Option: 1