1. The police arrested four criminals - P, Q, R and S. The criminals knew each other. They made the following statements :

P says "Q committed the crime."

Q says "S committed the crime."

R says" I did not do it."

S says "What Q said about me is false."

Assume only one of the arrested four committed the crime and only one of the statements made above is true. Who committed the crime ?

(1) P (2) R (3) S (4) Q

2. In a college, there are three student clubs, Sixty students are only in the Drama club, 80 students are only in the Dance club, 30 students are only in Maths club, 40 students are in both Drama and Dance clubs, 12 students are in both Dance and Maths clubs, 7 students are in both Drama and Maths clubs, and 2 students are in all clubs. If 75% of the students in the college are not in any of these clubs, then the total number of students in the college is ..... :

(1) 1000 (2) 975 (3) 900 (4) 225

3. The random experiment is rolling a pair of six sided dice. Compute the probability of the sum of two dice being 8.

(1) 5/36 (2) 7/36 (3) 6/36 (4) 8/36

4. Let G be an undirected complete graph on n vertices, where $n > 2$. Then, the number of different Hamiltonian cycles in G is equal to :

(1) $n!$ (2) $n-1!$ (3) 1 (4) $(n-1)!/2$

5. Let $A = \{1,2,3\}$. Then number of relations containing (1, 2) and (1, 3) which are reflexive and symmetric but not transitive are :

(1) 1 (2) 2 (3) 3 (4) 4

6. How many distinct binary functions of order 3 are there ?

(1) 32 (2) 256 (3) 64 (4) 128

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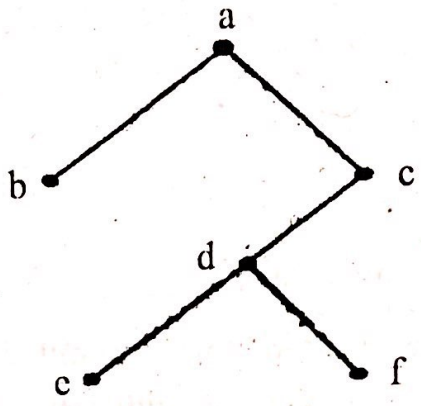
7. In the given tree list the order that the nodes are processed using preorder and postorde are :

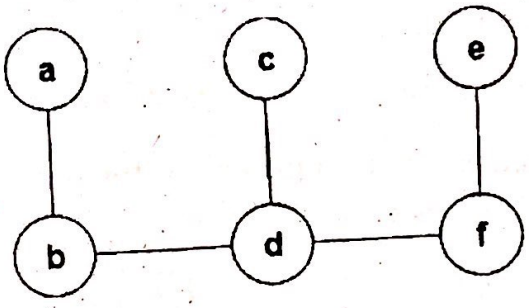


(1) b e f d c a; a c d f e b
(2) b e f d c a; a b c d e f
(3) a b c d e f; b e f d c a
(4) a b c d e f; f e d c b a

8. In graphical solutions of linear inequalities, solution can be divided into :
(1) one subset (2) two subsets (3) three subsets (4) four subsets

9. According to system of constraints, solution set graphical representation is classified as :
(1) region of ordinate solutions
(2) region of intercept solutions
(3) region of vertex solutions
(4) region of feasible solutions

10. How many Hamiltonian paths does the following graph have ?



(1) 1 (2) 2 (3) 0 (4) 3

11. Which one of the following electronic circuits can be used to store 1 bit of data ?
(1) Encoder (2) OR gate (3) Flip flop (4) Decoder

12. In 16-bit 2's complement representation, the decimal number –20 is :
(1) 1111 1111 0001 0100
(2) 0000 0000 1110 0100
(3) 1111 1111 1110 1100
(4) 1000 0000 1110 0100

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13. When an interrupt occurs, which one of the following takes place ?

(1) Execution of the current instruction is completed and the address of the next instruction is saved before the interrupt service program starts

(2) Execution of the current instruction is aborted and its address is saved before the interrupt service program starts

(3) Execution of the current instruction is completed and the interrupt service program starts

(4) Execution of the current instruction is aborted and the interrupt service program starts

14. Which one of the following is the ***correct*** arrangement of the ease of programming (from easiest to hardest) of various programming languages ?

(1) Binary machine code, hex code, assembly, high level language

(2) Binary machine code, assembly, hex code, high level language

(3) High level language, assembly, hex code, Binary machine code

(4) High level language, hex code, assembly, Binary machine code

15. Which one of the following is a valid comparison of the characteristics of an RISC and a CISC computer ?

(1) CISC computers exhibit better performance than RISC computers because complex instructions get executed in hardware.

(2) For the same program, a compiler generates more number of CISC instructions than RISC instructions.

(3) CISC computers usually have a higher MIPS rating as compared with comparable RISC computers.

(4) RISC computers deploy hardware control as compared with microprogrammed control in case of CISC computers.

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16. For transferring data from a hard disk to the attached computer on a page fault, which one of the following would be preferred mode of transfer ?

(1) Direct Memory access

(2) Programmed I/O

(3) Hardware interrupt driven I/O

(4) Software interrupt driven

17. A ROM is used to store the multiplication table of two 8 bit unsigned integers. What would be the size of required ROM ?

(1) 64K X 16bits (2) 16K X 8bits (3) 256 X 16 bits (4) 32K X 8bits

18. If four processors are to be interconnected with three memory modules using a crossbar interconnection, what is the minimum number of switches required ?

(1) 7 (2) 12 (3) 16 (4) 17

19. Distributed computers belong to which one of the following classes of computers ?

(1) SISD (2) SIMD (3) MIMD (4) MISD

20. What is the minimum number of 2-input NOR gates required to implement 4-variable function expressed in sum-of-minterms from as $f = \Sigma (0, 2, 5, 7, 8, 10, 13, 15)$? Assume that all the inputs and their complements are available.

(1) 3 (2) 4 (3) 5 (4) 6

21. In orthographic projection, the object is placed with one of its faces ..... to the picture plane.

(1) Inclined (2) Perpendicular (3) Parallel (4) Any of the above

22. The intersection of primary ROB colours and primary CMYK colours produces ..... and ..... colour respectively

(1) White colour, White colour

(2) White colour, Black colour

(3) Black colour, White colour

(4) Black colour, Black colour

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23. Let swap ( ) be a function that swaps two elements using their addresses. Consider the following C function :

```
void fun(int arr[ ], int n)
{
    for (int i = 0; i < n; i + = 2)
    {
        if (i > 0 && arr[i – 1] > arr[i] )
            swap(&arr[i], &arr[i-1]);
        if (i < n – 1 && arr[i] < arr[i + 1] )
            swap(&arr[i], &arr[i + 1]);
    }
}
```

If an array {10, 20, 30, 40, 50, 60, 70, 80} is passed to the function, the array is changed to :

(1) {20, 10, 40, 30, 60, 50, 80, 70}
(2) {10, 30, 20, 40,60, 50, 80, 70}
(3) {10, 20, 30, 40, 50, 60, 70, 80}
(4) {80, 70, 60, 50, 40, 30, 20, 10}

24. What is the return value of f(p, p), if the value of p is initialized to 5 before the call? Note that the first parameter is passed by reference, whereas the second parameter is passed by value :

```
int (int &x, int c) {
    c = c – 1;
    if (c == 0) return 1;
    x = x + 1;
    return f(x, c) * x;
}
```

(1) 3024 (2) 6561 (3) 55440 (4) 161051

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25. Which of the following is used to open document in new window ?

(1) Link (2) Link

(3) Link (4) Link

26. What is the difference between servlets and applets ?

i. Servlets execute on Server; Applets execute on browser

ii. Servlets have no GUI; Applet has GUI

iii. Servlets creates static web pages; Applets creates dynamic web pages

iv. Servlets can handle only a single request; Applet can handle multiple requests

(1) i, ii, iii are correct (2) i, ii are correct

(3) i, iii are correct (4) i, ii, iii, iv are correct

27. The transformation in which an object can be shifted to any coordinate position in three dimensional plane are called :

(1) Translation (2) Scaling (3) Rotation (4) All of these

28. While inheriting a class, if no access mode is specified, then which among the following is ***true*** ? (in C++)

(1) It gets inherited publicly by default

(2) It gets inherited protected by default

(3) It gets inherited privately by default

(4) It is not possible

29. The most appropriate matching for the following pairs is :

X : Indirect addressing	(i) : Loops
Y : Imeediate addressing	(ii) : Pointers
Z : Auto decrement addressing	(iii) : Constants

(1) X – (iii), Y – (ii), Z– (i) (2) X – (i), Y – (iii), Z– (ii)

(3) X – (ii), Y – (iii), Z– (i) (4) X – (iii), Y – (i), Z– (ii)

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30. fseek( ) should be preferred over rewind( ) mainly because :

(1) rewind( ) doesn't work for empty files

(2) rewind( ) may fail for large files

(3) In rewind, there is no way to check if the operations completed successfully

(4) All of the above

31. One of the main challenge/s of NLP is ..... .

(1) Handling Ambiguity of Sentences

(2) Handling Tokenization

(3) Handling POS- Tagging

(4) All of the mentioned

32. What is state space ?

(1) The whole problem

(2) Your Definition to a problem

(3) Problem you design

(4) Representing your problem with variable and parameter

33. Which search is similar to min-max search ?

(1) Hill-climbing search

(2) Depth-first search

(3) Breadth-first search

(4) All of the mentioned

34. A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalization, the output will be zero when and only when the input is :

(1) 000 or 110 or 011 or 101

(2) 010 or 100 or 110 or 101

(3) 000 or 010 or 110 or 100

(4) 100 or 111 or 101 or 001

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35. The truth values of traditional set theory is ..... and that of fuzzy set is ..... .

(1) Either 0 or 1, between 0 & 1

(2) Between 0 & 1, either 0 or 1

(3) Between 0 & 1, between 0 & 1

(4) Either 0 or 1, either 0 or 1

36. Which of the following statement(s) is/are ***true*** for Gradient Decent (GD) and Stochastic Gradient Decent (SGD) ?

a. In GD and SGD, you update a set of parameters in an iterative manner to minimize the error function.

b. In SGD, you have to run through all the samples in your training set for a single update of a parameter in each iteration.

c. In GD, you either use the entire data or a subset of training data to update a parameter in each iteration.

(1) Only a (2) Only b (3) Only c (4) a, b and c

37. In hopfield network with symmetric weights, energy at each state may ?

(1) increase (2) decrease

(3) decrease or remain same (4) decrease or increase

38. In which of the following learning techniques, the teacher returns reward and punishment to learner ?

(1) Active learning (2) Reinforcement learning

(3) Supervised learning (4) Unsupervised learning

39. ..... algorithm(s) is used to extract the plan directly from the planning graph, rather than using graph to provide heuristic.

(1) BFS/DFS (2) A* (3) Graph-Plan (4) Greedy

40. Inference algorithm is complete only if :

(1) It can derive any sentence

(2) It can derive any sentence that is an entailed version

(3) It is truth preserving

(4) It can derive any sentence that is an entailed version & It is truth preserving

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41. Database : In second normal form .....

(1) A composite attributes is converted to individual attributes.

(2) Non key attributes are functionally dependent on key attributes.

(3) The non key attributes functionally dependent not on a part of key attributes.

(4) All the above.

42. What stores the metadata about the structure of the database, in particular the schema of the database ?

(1) Indices (2) Database log

(3) Data files (4) Data Dictionary

43. Consider the following Employee table :

ID	salary	DeptName
1	10000	EC
2	40000	EC
3	30000	CS
4	40000	ME
5	50000	ME
6	60000	ME
7	70000	CS

How many rows are there in the result of following query ?

```
SELECT E.ID
FROM Employee E
WHERE EXISTS (SELECT E2.salary
    FROM Employee E2
    WHERE E2.DeptName = 'CS'
    AND E.salary> E2.salary)
```

(1) 0 (2) 4 (3) 5 (4) 6

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44. In DBMS, index is clustered, if :

(1) it is on a set of fields that form a candidate key.

(2) it is on a set of fields that include the primary key.

(3) the data records of the file are organized in the same order as the data entries of the index.

(4) the data records of the file are organized not in the same order as the data entries of the index.

45. Which of the following statement is ***true*** for the "Reconciled data" ?

(1) Data stored in the various operational systems throughout the organization.

(2) Current data intended to be the single source for all decision support systems.

(3) Data stored in one operational system in the organization.

(4) Data that has been selected and formatted for end-user support applications.

46. Data warehouse is :

(1) The actual discovery phase of a knowledge discovery process

(2) The stage of selecting the right data for a KDD process

(3) A subject-oriented integrated time variant non-volatile collection of data in support of management

(4) None of these

47. The need to synchronize data upon update is called ..... .

(1) Data Manipulation (2) Data Replication

(3) Data Coherency (4) Data Imitation

48. ..... can best be described as a programming model used to develop Hadoop-based applications that can process massive amounts of data.

(1) MapReduce (2) Mahout

(3) Oozie (4) All of the mentioned

49. The attribute AGE is calculated from DATE_OF _BIRTH. The attribute AGE is ..... .

(1) Single valued (2) Multi valued (3) Composite (4) Derived

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50. Which of the following is a NoSQL Database Type ?

(1) SQL

(2) Document databases

(3) JSON

(4) All of the mentioned

51. A scheduling algorithm assigns priority proportional to the waiting time of a process. Every process starts with priority zero (the lowest priority). The scheduler re-evaluates the process priorities every T time units and decides the next process to schedule. Which one of the following is ***true*** if the processes have no I/O operations and all arrive at time zero ?

(1) This algorithm is equivalent to the first-come-first-serve algorithm.

(2) This algorithm is equivalent to the round-robin algorithm.

(3) This algorithm is equivalent to the shortest-job-first algorithm .

(4) This algorithm is equivalent to the shortest-remaining-time-first algorithm.

52. An operating system maintains smaller data structures for a thread than a process, as a thread is usually defined as a ' light weight process'. What is the per thread basis of the operating system ?

(1) Does not maintain a separate stack

(2) Maintains only CPU register state

(3) Does not maintain a virtual memory state

(4) Maintains only scheduling and accounting information

53. Which of the following statements are ***true*** ?

(1) Shortest remaining time first scheduling may cause starvation

(2) Starvation may be caused by pre-emptive scheduling.

(3) In terms of response time robin round is better than FCFS

(4) All of the above statements are true

54. Which of the following statements is ***true*** for the dirty page in a page table ?

(1) Helps to maintain LRU information

(2) Allows only read on a page

(3) Helps to avoid unnecessary writes on paging device

(4) None of the above

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55. The following program consists of 3 concurrent processes and 3 binary semaphores. The semaphores are initialized as S0 = 1, S1 = 0, S2 = 0.

```
Process P0
while(true)
{
    wait(S0);
    print '0';
    release(S1);
    release(S2);
}

Process PI
waite(S1);
release(S0);

Process P2
wait(S2);
release(S0);
```

How many times will P0 print '0'?

(1) At least twice (2) Exactly twice (3) Exactly thrice (4) Exactly once

56. .....is not possible in distributed file system.

(1) File replication (2) Migration

(3) Client interface (4) Remote access

57. In LINUX, a file named file 01 should be readable, writable and executable only by the user(owner). Which one of the following set of command will be used ?

(1) chmod 700 file01 (2) chmod 000 file01

(3) chmod 477 file01 (4) chmod 007 file01

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58. Which is an unsolvable problem in access-matrix ?

(1) Owner override
(2) Brute force
(3) Access denied
(4) Confinement

59. Data Encryption Standard is an example of a ..... cryptosystem.

(1) Symmetric-key
(2) public key
(3) hash key
(4) asymmetric-key

60. RAID level ..... is also known as block interleaved parity organisation and uses block level striping and keeps a parity block on a separate disk.

(1) 1 (2) 2 (3) 3 (4) 4

61. Which one of the following is ***not*** desired in a good Software Requirement Specifications (SRS) document ?

(1) Functional Requirements
(2) Non-Functional Requirements
(3) Goals of Implementation
(4) Algorithms for Software Implementation

62. The Phases of formal review process, in software engineering are mentioned below. Arrange them in the ***correct*** order :

i. Planning
ii. Review Meeting
iii. Rework
iv. Individual Preparations
v. Kick Off
vi. Follow Up

(1) i, ii, iii, iv, v, vi
(2) vi, i, ii, iii, iv, v
(3) i, v, iv, ii, iii, vi
(4) i, ii, iii, v, iv, vi

63. System architecture is determined during which phase ?

(1) Requirement gathering
(2) Implementation
(3) Development
(4) Design

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64. Component testing is a :

(1) Black box testing
(2) White box testing
(3) Grey box testing
(4) Both (1) and (2)

65. The objective of software project planning is to :

(1) Convince the customer that a project is feasible
(2) Make use of historical project data
(3) Enable a manager to make reasonable estimates of cost and schedule
(4) Determine the probable profit margin prior to bidding on a project

66. In Software Engineering which is ***not*** an element of requirement model ?

(1) Behavioural elements
(2) Class based elements
(3) Data elements
(4) Scenario based elements

67. The model which estimates the total effort in terms of person, months of the technical project staff is ..... .

(1) Spiral Model
(2) Waterfall model
(3) Win-win spiral model
(4) COCOMO Model

68. Agile Modelling (AM) provides guidance to practitioner during which of these software tasks ?

(1) Analysis (2) Design (3) Testing (4) Both 1 and 2

69. Read the columns and match the following :

(a) Data coupling	(i) Module A and Module B have shared data.
(b) Stamp coupling	(ii) Dependency between modules is based on the fact they communicate by only passing of data.
(c) Common coupling	(iii) When complete data structure is passed from one module to another.
(d) Content coupling	(iv) When the control is passed from one module to the middle of another.

(1) a - iii, b - ii, c - i, d - iv
(2) a - ii, b - iii, c - i, d - iv
(3) a - ii, b - iii, c - iv, d - i
(4) a - iii, b - ii, c - iv, d - i

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70. Which of the following is ***not*** included in the Software requirements specification document ?

(1) Functional Requirements

(2) Non- functional requirements

(3) Goals of implementation

(4) User Manual

71. Which one of the following statements is ***not*** correct about the B+ tree data structure used for creating an index of a relational database table ?

(1) B+ Tree is a height-balanced tree

(2) Non-leaf nodes have pointers to data records

(3) Key values in each node are kept in sorted order

(4) Each leaf node has a pointer to the next leaf node

72. Select the ***correct*** asymptotic complexity of an algorithm with runtime T(n, n) where

$T(x, c) = \Theta(x)$ for $c <= 2$,

$T(c, y) = \Theta(y)$ for $c <= 2$, and

$T(x, y) = \Theta(x+y) + T(x/2, y/2)$

(1) $\Theta(n\text{Log}n)$ (2) $\Theta(n^2)$ (3) $\Theta(n)$ (4) $\Theta(n^2\text{Log}n)$

73. Which of the following changes to QuickSort algorithm will improve its performance on average and are generally done in practice ?

A. Randomly picking up to make worst case less likely to occur.

B. Calling insertion sort for small sized arrays to reduce recursive calls.

C. QuickSort is tail recursive, so tail call optimizations can be done.

D. A linear time median searching algorithm is used to pick the median, so that the worst case time reduces to $O(n \text{Log}_n)$

(1) A and B (2) B, C and D (3) A, B and C (4) B, C and D

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74. The number of elements that can be sorted in (log n) time using heap sort is :

A. $\Theta(1)$ B. $\Theta(\sqrt{\log n})$ C. $\Theta\left(\frac{\log n}{\log\log n}\right)$ D. $\Theta(\log n)$

(1) A (2) B (3) C (4) D

75. Consider a complete graph G with 4 vertices. The graph G has ..... spanning trees.

(1) 15 (2) 8 (3) 16 (4) 13

76. ..... solves the problem of finding the shortest path from a point in a graph to a destination.

(1) Kruskal's algorithm (2) Prim's algorithm

(3) Dijkstra algorithm (4) Bellman ford algorithm

77. The number of comparisons done by sequential search is :

(1) $(N/2) - 1$ (2) $(N + 1)/2$ (3) $(N - 1)/2$ (4) $(N + 2)/2$

78. Consider the tree arcs of a BFS traversal from a source node W in an unweighted, connected, undirected graph. The tree T formed by the tree arcs is a data structure for computing :

(1) the shortest path between every pair of vertices.

(2) the shortest path from W to every vertex in the graph.

(3) the shortest paths from W to only those nodes that are leaves of T.

(4) the longest path in the graph.

79. 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 :

(1) 3, 0, and 1 (2) 3, 3, and 3 (3) 4, 0, and 1 (4) 3, 0, and 2

80. A B-tree of order 4 and of height 3 will have a maximum of ..... keys.

(1) 255 (2) 63 (3) 127 (4) 188

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81. Consider the following grammar :

$P \rightarrow x\ Q\ R\ S$

$Q \rightarrow y\ z \mid z$

$R \rightarrow w \mid \varepsilon$

$S \rightarrow y$

What is FOLLOW (Q) ?

(1) {R} (2) {w} (3) {w, y} (4) {w, $}

82. Pushdown machine represents :

(1) Type 3 regular grammar (2) Type 2 context free grammar

(3) Type 1 Context sensitive grammar (4) Type 0 grammar

83. The languages generated by Turing machine are :

(1) Recursively enumerable languages

(2) Regular languages

(3) Regular expression

(4) Context free languages

84. Any strings of terminals that can be generated by CFG is :

$S \rightarrow XY$

$X \rightarrow aX \mid bX \mid a$

$Y \rightarrow Ya \mid Yb \mid b$

(1) has at least one b (2) should end by 'a'

(3) has no consecutive a's or b's (4) has at least 2a's

85. In a compiler, keywords of a language are recognized during :

(1) parsing of the program

(2) the code generation

(3) the lexical analysis of the program

(4) dataflow analysis

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86. Match all items in **Group 1** with *correct* options from those given in **Group 2** :

Group 1	**Group 2**
P. Regular expression	(i) Syntax analysis
Q. Pushdown automata	(ii) Code generation
R. Dataflow analysis	(iii) Lexical analysis
S. Register allocation	(iv) Code optimization

(1) P-(iv) Q-(i), R-(ii), S-(iii)

(2) P-(iii), Q-(i), R-(iv), S-(ii)

(3) P-(iii), Q-(iv), R-(i), S-(ii)

(4) P-(ii), Q-(i), R-(iv), S-(iii)

87. An LALR(I) parser for a grammar G can have shift-reduce (S-R) conflicts if and only if :

(1) the SLR(1) parser for G has S-R conflicts

(2) the LR(1) parser for G has S-R conflicts

(3) the LR(0) parser for G has S-R conflicts

(4) the LALR(1) parser for G has reduce-reduce conflicts

88. Rahul, Mohan, Srinivas and Arun are seated around a square table. Rahul is sitting to the left of Mohan. Srinivas is sitting to the right of Arun. Which of the following pairs are seated opposite each other ?

(1) Rahul and Mohan

(2) Srinivas and Arun

(3) Srinivas and Mohan

(4) Srinivas and Rahul

89. Consider the following languages :

$L_1 = \{0^p 1^q 0^r \mid p,q,r \geq 0\}$

$L_2 = \{0^p 1^q 0^r \mid p,q,r \geq 0,\ p \neq r\}$

Which one of the following statements is ***false*** ?

(1) L_2 is context-free

(2) L_1 intersection L_2 is context-free

(3) Complement of L_2 is recursive

(4) Complement of L_1 is context-free but not regular

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90. Resolution of externally defined symbols is performed by :

(1) Linker (2) Loader (3) Compiler (4) Interpreter

91. Consider that 15 machines need to be connected in a LAN using 8-port Ethernet switches. Assume that these switches do not have any separate up link ports. The minimum number of switches needed is ..... .

(1) 3 (2) 4 (3) 5 (4) 6

92. An analog signal carries four bits in each signal element. Find the baud rate and bit rate, if 2000 signal elements are sent per second :

(1) 2000bauds per sec, 8000bps

(2) 8000bauds per sec, 2000bps

(3) 2000bauds per sec, 2000bps

(4) 8000bauds per sec, 8000bps

93. Using Cyclic Redundancy Check (CRC), find what is the dividend at the receiver, if the data unit is 111111 and the divisor is 1010 ?

(1) 111111011 (2) 111111110 (3) 1010110 (4) 110111111

94. In the IPv4 addressing format, the number of networks allowed under Class C addresses is :

(1) 2^{14} (2) 2^{7} (3) 2^{21} (4) 2^{24}

95. What is the use of Ping command ?

(1) To know network speed

(2) To test storage device

(3) To test a host on the network is reachable

(4) None of the above

96. Which layer is CoAP ?

(1) Control layer (2) Transport layer

(3) Service layer (4) Application layer

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97. Which layer in OSI model is responsible for translation, encryption and compression of data ?

(1) Session layer
(2) Application layer
(3) Presentation layer
(4) Physical layer

98. The ..... protocol is used for the transmission of e-mails and ..... protocol is used by email programs to retrieve emails from an email server.

(1) POP, SMTP (2) SMTP, POP (3) SMTP, SMTP (4) POP, POP

99. Point out the ***correct*** statement with regard to Cloud Computing :

(1) Platforms can be based on specific types of development languages, application frameworks, or other constructs.
(2) SaaS is the cloud-based equivalent of shrink-wrapped software.
(3) Software as a Service (SaaS) may be succinctly described as software that is deployed on a hosted service.
(4) All of the mentioned.

100. In IoT, MQTT is ..... oriented.

(1) Data (2) Message (3) Network (4) Device

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A

SET-Z

M.Phil./Ph.D./URS-EE-2019

SUBJECT : Computer Science

Sr. No. 10009

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

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B

SET-Z

M.Phil./Ph.D./URS-EE-2019

SUBJECT : Computer Science

Sr. No. 10002

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

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1. Which one of the following statements is ***not*** correct about the B+ tree data structure used for creating an index of a relational database table ?

   (1) B+ Tree is a height-balanced tree

   (2) Non-leaf nodes have pointers to data records

   (3) Key values in each node are kept in sorted order

   (4) Each leaf node has a pointer to the next leaf node

2. Select the ***correct*** asymptotic complexity of an algorithm with runtime T(n, n) where

   $T(x, c) = \Theta(x)$ for $c <= 2$,

   $T(c, y) = \Theta(y)$ for $c <= 2$, and

   $T(x, y) = \Theta(x+y) + T(x/2, y/2)$

   (1) $\Theta(nLogn)$ (2) $\Theta(n^2)$

   (3) $\Theta(n)$ (4) $\Theta(n^2Logn)$

3. Which of the following changes to QuickSort algorithm will improve its performance on average and are generally done in practice ?

   A. Randomly picking up to make worst case less likely to occur.

   B. Calling insertion sort for small sized arrays to reduce recursive calls.

   C. QuickSort is tail recursive, so tail call optimizations can be done.

   D. A linear time median searching algorithm is used to pick the median, so that the worst case time reduces to $O(n\ Log_n)$

   (1) A and B (2) B, C and D

   (3) A, B and C (4) B, C and D

4. The number of elements that can be sorted in (log n) time using heap sort is :

   A. $\Theta(1)$ B. $\Theta\left(\sqrt{\log n}\right)$ C. $\Theta\left(\frac{\log n}{\log\log n}\right)$ D. $\Theta(\log n)$

   (1) A (2) B (3) C (4) D

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5. Consider a complete graph G with 4 vertices. The graph G has ..... spanning trees.

(1) 15 (2) 8 (3) 16 (4) 13

6. ..... solves the problem of finding the shortest path from a point in a graph to a destination.

(1) Kruskal's algorithm (2) Prim's algorithm

(3) Dijkstra algorithm (4) Bellman ford algorithm.

7. The number of comparisons done by sequential search is :

(1) $(N/2) - 1$ (2) $(N + 1)/2$

(3) $(N - 1)/2$ (4) $(N + 2)/2$

8. Consider the tree arcs of a BFS traversal from a source node W in an unweighted, connected, undirected graph. The tree T formed by the tree arcs is a data structure for computing :

(1) the shortest path between every pair of vertices.

(2) the shortest path from W to every vertex in the graph.

(3) the shortest paths from W to only those nodes that are leaves of T.

(4) the longest path in the graph.

9. 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 :

(1) 3, 0, and 1 (2) 3, 3, and 3

(3) 4, 0, and 1 (4) 3, 0, and 2

10. A B-tree of order 4 and of height 3 will have a maximum of ..... keys.

(1) 255 (2) 63

(3) 127 (4) 188

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11. A scheduling algorithm assigns priority proportional to the waiting time of a process. Every process starts with priority zero (the lowest priority). The scheduler re-evaluates the process priorities every T time units and decides the next process to schedule. Which one of the following is ***true*** if the processes have no I/O operations and all arrive at time zero ?

(1) This algorithm is equivalent to the first-come-first-serve algorithm.

(2) This algorithm is equivalent to the round-robin algorithm.

(3) This algorithm is equivalent to the shortest-job-first algorithm .

(4) This algorithm is equivalent to the shortest-remaining-time-first algorithm.

12. An operating system maintains smaller data structures for a thread than a process, as a thread is usually defined as a ' light weight process'. What is the per thread basis of the operating system ?

(1) Does not maintain a separate stack

(2) Maintains only CPU register state

(3) Does not maintain a virtual memory state

(4) Maintains only scheduling and accounting information

13. Which of the following statements are ***true*** ?

(1) Shortest remaining time first scheduling may cause starvation

(2) Starvation may be caused by pre-emptive scheduling.

(3) In terms of response time robin round is better than FCFS

(4) All of the above statements are true

14. Which of the following statements is ***true*** for the dirty page in a page table ?

(1) Helps to maintain LRU information

(2) Allows only read on a page

(3) Helps to avoid unnecessary writes on paging device

(4) None of the above

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15. The following program consists of 3 concurrent processes and 3 binary semaphores. The semaphores are initialized as S0 = 1, S1 = 0, S2 = 0.

```
Process P0
while(true)
{
    wait(S0);
    print '0';
    release(S1);
    release(S2);
}

Process PI
waite(S1);
release(S0);

Process P2
wait(S2);
release(S0);
```

How many times will P0 print '0'?

(1) At least twice (2) Exactly twice (3) Exactly thrice (4) Exactly once

16. .....is not possible in distributed file system.

(1) File replication (2) Migration

(3) Client interface (4) Remote access

17. In LINUX, a file named file 01 should be readable, writable and executable only by the user(owner). Which one of the following set of command will be used ?

(1) chmod 700 file01 (2) chmod 000 file01

(3) chmod 477 file01 (4) chmod 007 file01

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18. Which is an unsolvable problem in access-matrix ?

(1) Owner override (2) Brute force

(3) Access denied (4) Confinement

19. Data Encryption Standard is an example of a ..... cryptosystem.

(1) Symmetric-key (2) public key

(3) hash key (4) asymmetric-key

20. RAID level ..... is also known as block interleaved parity organisation and uses block level striping and keeps a parity block on a separate disk.

(1) 1 (2) 2 (3) 3 (4) 4

21. One of the main challenge/s of NLP is ..... .

(1) Handling Ambiguity of Sentences

(2) Handling Tokenization

(3) Handling POS- Tagging

(4) All of the mentioned

22. What is state space ?

(1) The whole problem

(2) Your Definition to a problem

(3) Problem you design

(4) Representing your problem with variable and parameter

23. Which search is similar to min-max search ?

(1) Hill-climbing search (2) Depth-first search

(3) Breadth-first search (4) All of the mentioned

24. A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalization, the output will be zero when and only when the input is :

(1) 000 or 110 or 011 or 101 (2) 010 or 100 or 110 or 101

(3) 000 or 010 or 110 or 100 (4) 100 or 111 or 101 or 001

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25. The truth values of traditional set theory is ..... and that of fuzzy set is ..... .

(1) Either 0 or 1, between 0 & 1

(2) Between 0 & 1, either 0 or 1

(3) Between 0 & 1, between 0 & 1

(4) Either 0 or 1, either 0 or 1

26. Which of the following statement(s) is/are ***true*** for Gradient Decent (GD) and Stochastic Gradient Decent (SGD) ?

a. In GD and SGD, you update a set of parameters in an iterative manner to minimize the error function.

b. In SGD, you have to run through all the samples in your training set for a single update of a parameter in each iteration.

c. In GD, you either use the entire data or a subset of training data to update a parameter in each iteration.

(1) Only a (2) Only b (3) Only c (4) a, b and c

27. In hopfield network with symmetric weights, energy at each state may ?

(1) increase (2) decrease

(3) decrease or remain same (4) decrease or increase

28. In which of the following learning techniques, the teacher returns reward and punishment to learner ?

(1) Active learning (2) Reinforcement learning

(3) Supervised learning (4) Unsupervised learning

29. ..... algorithm(s) is used to extract the plan directly from the planning graph, rather than using graph to provide heuristic.

(1) BFS/DFS (2) A* (3) Graph-Plan (4) Greedy

30. Inference algorithm is complete only if :

(1) It can derive any sentence

(2) It can derive any sentence that is an entailed version

(3) It is truth preserving

(4) It can derive any sentence that is an entailed version & It is truth preserving

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31. Which one of the following electronic circuits can be used to store 1 bit of data ?

(1) Encoder (2) OR gate (3) Flip flop (4) Decoder

32. In 16-bit 2's complement representation, the decimal number –20 is :

(1) 1111 1111 0001 0100 (2) 0000 0000 1110 0100

(3) 1111 1111 1110 1100 (4) 1000 0000 1110 0100

33. When an interrupt occurs, which one of the following takes place ?

(1) Execution of the current instruction is completed and the address of the next instruction is saved before the interrupt service program starts

(2) Execution of the current instruction is aborted and its address is saved before the interrupt service program starts

(3) Execution of the current instruction is completed and the interrupt service program starts

(4) Execution of the current instruction is aborted and the interrupt service program starts

34. Which one of the following is the ***correct*** arrangement of the ease of programming (from easiest to hardest) of various programming languages ?

(1) Binary machine code, hex code, assembly, high level language

(2) Binary machine code, assembly, hex code, high level language

(3) High level language, assembly, hex code, Binary machine code

(4) High level language, hex code, assembly, Binary machine code

35. Which one of the following is a valid comparison of the characteristics of an RISC and a CISC computer ?

(1) CISC computers exhibit better performance than RISC computers because complex instructions get executed in hardware.

(2) For the same program, a compiler generates more number of CISC instructions than RISC instructions.

(3) CISC computers usually have a higher MIPS rating as compared with comparable RISC computers.

(4) RISC computers deploy hardware control as compared with microprogrammed control in case of CISC computers.

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36. For transferring data from a hard disk to the attached computer on a page fault, which one of the following would be preferred mode of transfer ?

(1) Direct Memory access

(2) Programmed I/O

(3) Hardware interrupt driven I/O

(4) Software interrupt driven

37. A ROM is used to store the multiplication table of two 8 bit unsigned integers. What would be the size of required ROM ?

(1) 64K X 16bits (2) 16K X 8bits (3) 256 X 16 bits (4) 32K X 8bits

38. If four processors are to be interconnected with three memory modules using a crossbar interconnection, what is the minimum number of switches required ?

(1) 7 (2) 12 (3) 16 (4) 17

39. Distributed computers belong to which one of the following classes of computers ?

(1) SISD (2) SIMD (3) MIMD (4) MISD

40. What is the minimum number of 2-input NOR gates required to implement 4-variable function expressed in sum-of-minterms from as $f = \Sigma (0, 2, 5, 7, 8, 10, 13, 15)$? Assume that all the inputs and their complements are available.

(1) 3 (2) 4 (3) 5 (4) 6

41. Consider that 15 machines need to be connected in a LAN using 8-port Ethernet switches. Assume that these switches do not have any separate up link ports. The minimum number of switches needed is ..... .

(1) 3 (2) 4 (3) 5 (4) 6

42. An analog signal carries four bits in each signal element. Find the baud rate and bit rate, if 2000 signal elements are sent per second :

(1) 2000bauds per sec, 8000bps

(2) 8000bauds per sec, 2000bps

(3) 2000bauds per sec, 2000bps

(4) 8000bauds per sec, 8000bps

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43. Using Cyclic Redundancy Check (CRC), find what is the dividend at the receiver, if the data unit is 111111 and the divisor is 1010 ?

(1) 111111011 (2) 111111110 (3) 1010110 (4) 110111111

44. In the IPv4 addressing format, the number of networks allowed under Class C addresses is :

(1) 2^{14} (2) 2^{7} (3) 2^{21} (4) 2^{24}

45. What is the use of Ping command ?

(1) To know network speed

(2) To test storage device

(3) To test a host on the network is reachable

(4) None of the above

46. Which layer is CoAP ?

(1) Control layer (2) Transport layer

(3) Service layer (4) Application layer

47. Which layer in OSI model is responsible for translation, encryption and compression of data ?

(1) Session layer (2) Application layer

(3) Presentation layer (4) Physical layer

48. The ..... protocol is used for the transmission of e-mails and ..... protocol is used by email programs to retrieve emails from an email server.

(1) POP, SMTP (2) SMTP, POP (3) SMTP, SMTP (4) POP, POP

49. Point out the ***correct*** statement with regard to Cloud Computing :

(1) Platforms can be based on specific types of development languages, application frameworks, or other constructs.

(2) SaaS is the cloud-based equivalent of shrink-wrapped software.

(3) Software as a Service (SaaS) may be succinctly described as software that is deployed on a hosted service.

(4) All of the mentioned.

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50. In IoT, MQTT is ..... oriented.

(1) Data (2) Message

(3) Network (4) Device

51. Which one of the following is ***not*** desired in a good Software Requirement Specifications (SRS) document ?

(1) Functional Requirements

(2) Non-Functional Requirements

(3) Goals of Implementation

(4) Algorithms for Software Implementation

52. The Phases of formal review process, in software engineering are mentioned below. Arrange them in the ***correct*** order :

i. Planning

ii. Review Meeting

iii. Rework

iv. Individual Preparations

v. Kick Off

vi. Follow Up

(1) i, ii, iii, iv, v, vi (2) vi, i, ii, iii, iv, v

(3) i, v, iv, ii, iii, vi (4) i, ii, iii, v, iv, vi

53. System architecture is determined during which phase ?

(1) Requirement gathering (2) Implementation

(3) Development (4) Design

54. Component testing is a :

(1) Black box testing (2) White box testing

(3) Grey box testing (4) Both (1) and (2)

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55. The objective of software project planning is to :

(1) Convince the customer that a project is feasible

(2) Make use of historical project data

(3) Enable a manager to make reasonable estimates of cost and schedule

(4) Determine the probable profit margin prior to bidding on a project

56. In Software Engineering which is ***not*** an element of requirement model ?

(1) Behavioural elements (2) Class based elements

(3) Data elements (4) Scenario based elements

57. The model which estimates the total effort in terms of person, months of the technical project staff is ..... .

(1) Spiral Model (2) Waterfall model

(3) Win-win spiral model (4) COCOMO Model

58. Agile Modelling (AM) provides guidance to practitioner during which of these software tasks ?

(1) Analysis (2) Design (3) Testing (4) Both 1 and 2

59. Read the columns and match the following :

(a) Data coupling	(i) Module A and Module B have shared data.
(b) Stamp coupling	(ii) Dependency between modules is based on the fact they communicate by only passing of data.
(c) Common coupling	(iii) When complete data structure is passed from one module to another.
(d) Content coupling	(iv) When the control is passed from one module to the middle of another.

(1) a - iii, b - ii, c - i, d - iv (2) a - ii, b - iii, c - i, d - iv

(3) a - ii, b - iii, c - iv, d - i (4) a - iii, b - ii, c - iv, d - i

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60. Which of the following is ***not*** included in the Software requirements specification document ?

(1) Functional Requirements

(2) Non- functional requirements

(3) Goals of implementation

(4) User Manual

61. Consider the following grammar :

$P \rightarrow x\ Q\ R\ S$

$Q \rightarrow y\ z \mid z$

$R \rightarrow w \mid \varepsilon$

$S \rightarrow y$

What is FOLLOW (Q) ?

(1) {R} (2) {w} (3) {w, y} (4) {w, $}

62. Pushdown machine represents :

(1) Type 3 regular grammar (2) Type 2 context free grammar

(3) Type 1 Context sensitive grammar (4) Type 0 grammar

63. The languages generated by Turing machine are :

(1) Recursively enumerable languages

(2) Regular languages

(3) Regular expression

(4) Context free languages

64. Any strings of terminals that can be generated by CFG is :

$S \rightarrow XY$

$X \rightarrow aX \mid bX \mid a$

$Y \rightarrow Ya \mid Yb \mid b$

(1) has at least one b (2) should end by 'a'

(3) has no consecutive a's or b's (4) has at least 2a's

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65. In a compiler, keywords of a language are recognized during :

(1) parsing of the program

(2) the code generation

(3) the lexical analysis of the program

(4) dataflow analysis

66. Match all items in **Group 1** with ***correct*** options from those given in **Group 2** :

Group 1	**Group 2**
P. Regular expression	(i) Syntax analysis
Q. Pushdown automata	(ii) Code generation
R. Dataflow analysis	(iii) Lexical analysis
S. Register allocation	(iv) Code optimization

(1) P-(iv) Q-(i), R-(ii), S-(iii)

(2) P-(iii), Q-(i), R-(iv), S-(ii)

(3) P-(iii), Q-(iv), R-(i), S-(ii)

(4) P-(ii), Q-(i), R-(iv), S-(iii)

67. An LALR(I) parser for a grammar G can have shift-reduce (S-R) conflicts if and only if :

(1) the SLR(1) parser for G has S-R conflicts

(2) the LR(1) parser for G has S-R conflicts

(3) the LR(0) parser for G has S-R conflicts

(4) the LALR(1) parser for G has reduce-reduce conflicts

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68. Rahul, Mohan, Srinivas and Arun are seated around a square table. Rahul is sitting to the left of Mohan. Srinivas is sitting to the right of Arun. Which of the following pairs are seated opposite each other ?

(1) Rahul and Mohan
(2) Srinivas and Arun
(3) Srinivas and Mohan
(4) Srinivas and Rahul

69. Consider the following languages :

$L_1 = \{0^p 1^q 0^r \mid p,q,r \geq 0\}$

$L_2 = \{0^p 1^q 0^r \mid p,q,r \geq 0,\ p \neq r\}$

Which one of the following statements is ***false*** ?

(1) L_2 is context-free
(2) L_1 intersection L_2 is context-free
(3) Complement of L_2 is recursive
(4) Complement of L_1 is context-free but not regular

70. Resolution of externally defined symbols is performed by :

(1) Linker (2) Loader (3) Compiler (4) Interpreter

71. Database : In second normal form .....

(1) A composite attributes is converted to individual attributes.
(2) Non key attributes are functionally dependent on key attributes.
(3) The non key attributes functionally dependent not on a part of key attributes.
(4) All the above.

72. What stores the metadata about the structure of the database, in particular the schema of the database ?

(1) Indices
(2) Database log
(3) Data files
(4) Data Dictionary

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73. Consider the following Employee table :

ID	salary	DeptName
1	10000	EC
2	40000	EC
3	30000	CS
4	40000	ME
5	50000	ME
6	60000	ME
7	70000	CS

How many rows are there in the result of following query ?

```
SELECT E.ID
FROM Employee E
WHERE EXISTS (SELECT E2.salary
    FROM Employee E2
    WHERE E2.DeptName = 'CS'
    AND E.salary> E2.salary)
```

(1) 0 (2) 4 (3) 5 (4) 6

74. In DBMS, index is clustered, if :

(1) it is on a set of fields that form a candidate key.

(2) it is on a set of fields that include the primary key.

(3) the data records of the file are organized in the same order as the data entries of the index.

(4) the data records of the file are organized not in the same order as the data entries of the index.

75. Which of the following statement is ***true*** for the "Reconciled data" ?

(1) Data stored in the various operational systems throughout the organization.

(2) Current data intended to be the single source for all decision support systems.

(3) Data stored in one operational system in the organization.

(4) Data that has been selected and formatted for end-user support applications.

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76. Data warehouse is :

(1) The actual discovery phase of a knowledge discovery process

(2) The stage of selecting the right data for a KDD process

(3) A subject-oriented integrated time variant non-volatile collection of data in support of management

(4) None of these

77. The need to synchronize data upon update is called ..... .

(1) Data Manipulation (2) Data Replication

(3) Data Coherency (4) Data Imitation

78. ..... can best be described as a programming model used to develop Hadoop-based applications that can process massive amounts of data.

(1) MapReduce (2) Mahout

(3) Oozie (4) All of the mentioned

79. The attribute AGE is calculated from DATE_OF _BIRTH. The attribute AGE is ..... .

(1) Single valued (2) Multi valued (3) Composite (4) Derived

80. Which of the following is a NoSQL Database Type ?

(1) SQL (2) Document databases

(3) JSON (4) All of the mentioned

81. In orthographic projection, the object is placed with one of its faces ..... to the picture plane.

(1) Inclined (2) Perpendicular (3) Parallel (4) Any of the above

82. The intersection of primary ROB colours and primary CMYK colours produces ..... and ..... colour respectively

(1) White colour, White colour

(2) White colour, Black colour

(3) Black colour, White colour

(4) Black colour, Black colour

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83. Let swap ( ) be a function that swaps two elements using their addresses. Consider the following C function :

```
void fun(int arr[ ], int n)
{
    for (int i = 0; i < n; i + = 2)
    {
        if (i > 0 && arr[i – 1] > arr[i] )
            swap(&arr[i], &arr[i-1]);
        if (i < n – 1 && arr[i] < arr[i + 1] )
            swap(&arr[i], &arr[i + 1]);
    }
}
```

If an array {10, 20, 30, 40, 50, 60, 70, 80} is passed to the function, the array is changed to :

(1) {20, 10, 40, 30, 60, 50, 80, 70} (2) {10, 30, 20, 40,60, 50, 80, 70}

(3) {10, 20, 30, 40, 50, 60, 70, 80} (4) {80, 70, 60, 50, 40, 30, 20, 10}

84. What is the return value of f(p, p), if the value of p is initialized to 5 before the call? Note that the first parameter is passed by reference, whereas the second parameter is passed by value :

```
int (int &x, int c) {
    c = c – l;
    if (c == 0) return 1;
    x = x + 1;
    return f(x, c) * x;
}
```

(1) 3024 (2) 6561 (3) 55440 (4) 161051

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85. Which of the following is used to open document in new window ?

(1) Link

(2) Link

(3) Link

(4) Link

86. What is the difference between servlets and applets ?

i. Servlets execute on Server; Applets execute on browser

ii. Servlets have no GUI; Applet has GUI

iii. Servlets creates static web pages; Applets creates dynamic web pages

iv. Servlets can handle only a single request; Applet can handle multiple requests

(1) i, ii, iii are correct

(2) i, ii are correct

(3) i, iii are correct

(4) i, ii, iii, iv are correct

87. The transformation in which an object can be shifted to any coordinate position in three dimensional plane are called :

(1) Translation (2) Scaling (3) Rotation (4) All of these

88. While inheriting a class, if no access mode is specified, then which among the following is ***true*** ? (in C++)

(1) It gets inherited publicly by default

(2) It gets inherited protected by default

(3) It gets inherited privately by default

(4) It is not possible

89. The most appropriate matching for the following pairs is :

X : Indirect addressing	(i) : Loops
Y : Imeediate addressing	(ii) : Pointers
Z : Auto decrement addressing	(iii) : Constants

(1) X – (iii), Y – (ii), Z– (i)

(2) X – (i), Y – (iii), Z– (ii)

(3) X – (ii), Y – (iii), Z– (i)

(4) X – (iii), Y – (i), Z– (ii)

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90. fseek( ) should be preferred over rewind( ) mainly because :

(1) rewind( ) doesn't work for empty files

(2) rewind( ) may fail for large files

(3) In rewind, there is no way to check if the operations completed successfully

(4) All of the above

91. The police arrested four criminals - P, Q, R and S. The criminals knew each other. They made the following statements :

P says "Q committed the crime."

Q says "S committed the crime."

R says" I did not do it."

S says "What Q said about me is false."

Assume only one of the arrested four committed the crime and only one of the statements made above is true. Who committed the crime ?

(1) P (2) R (3) S (4) Q

92. In a college, there are three student clubs, Sixty students are only in the Drama club, 80 students are only in the Dance club, 30 students are only in Maths club, 40 students are in both Drama and Dance clubs, 12 students are in both Dance and Maths clubs, 7 students are in both Drama and Maths clubs, and 2 students are in all clubs. If 75% of the students in the college are not in any of these clubs, then the total number of students in the college is ..... :

(1) 1000 (2) 975 (3) 900 (4) 225

93. The random experiment is rolling a pair of six sided dice. Compute the probability of the sum of two dice being 8.

(1) 5/36 (2) 7/36 (3) 6/36 (4) 8/36

94. Let G be an undirected complete graph on n vertices, where $n > 2$. Then, the number of different Hamiltonian cycles in G is equal to :

(1) $n!$ (2) $n-1!$ (3) 1 (4) $(n-1)!/2$

95. Let $A = \{1,2,3\}$. Then number of relations containing (1, 2) and (1, 3) which are reflexive and symmetric but not transitive are :

(1) 1 (2) 2 (3) 3 (4) 4

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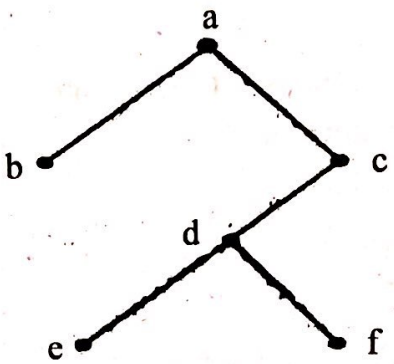
96. How many distinct binary functions of order 3 are there ?

(1) 32 (2) 256 (3) 64 (4) 128

97. In the given tree list the order that the nodes are processed using preorder and postorder are :



(1) b e f d c a; a c d f e b
(2) b e f d c a; a b c d e f
(3) a b c d e f; b e f d c a
(4) a b c d e f; f e d c b a

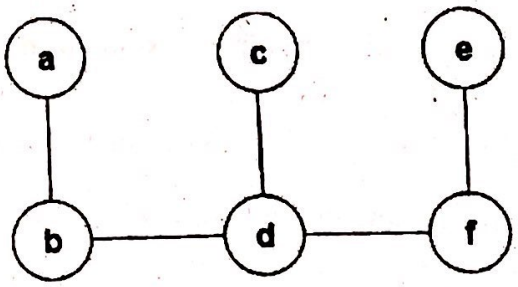
98. In graphical solutions of linear inequalities, solution can be divided into :

(1) one subset (2) two subsets (3) three subsets (4) four subsets

99. According to system of constraints, solution set graphical representation is classified as :

(1) region of ordinate solutions
(2) region of intercept solutions
(3) region of vertex solutions
(4) region of feasible solutions

100. How many Hamiltonian paths does the following graph have ?



(1) 1 (2) 2 (3) 0 (4) 3

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C

SET-Z

M.Phil./Ph.D./URS-EE-2019

SUBJECT : Computer Science

Sr. No. 10011

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name_____

Mother's Name_____ Date of Examination_____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

SEAL

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

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1. Database : In second normal form .....

(1) A composite attributes is converted to individual attributes.

(2) Non key attributes are functionally dependent on key attributes.

(3) The non key attributes functionally dependent not on a part of key attributes.

(4) All the above.

2. What stores the metadata about the structure of the database, in particular the schema of the database ?

(1) Indices (2) Database log

(3) Data files (4) Data Dictionary

3. Consider the following Employee table :

ID	salary	DeptName
1	10000	EC
2	40000	EC
3	30000	CS
4	40000	ME
5	50000	ME
6	60000	ME
7	70000	CS

How many rows are there in the result of following query ?

```
SELECT E.ID
FROM Employee E
WHERE EXISTS (SELECT E2.salary
    FROM Employee E2
    WHERE E2.DeptName = 'CS'
    AND E.salary> E2.salary)
```

(1) 0 (2) 4 (3) 5 (4) 6

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4. In DBMS, index is clustered, if :

(1) it is on a set of fields that form a candidate key.

(2) it is on a set of fields that include the primary key.

(3) the data records of the file are organized in the same order as the data entries of the index.

(4) the data records of the file are organized not in the same order as the data entries of the index.

5. Which of the following statement is ***true*** for the "Reconciled data" ?

(1) Data stored in the various operational systems throughout the organization.

(2) Current data intended to be the single source for all decision support systems.

(3) Data stored in one operational system in the organization.

(4) Data that has been selected and formatted for end-user support applications.

6. Data warehouse is :

(1) The actual discovery phase of a knowledge discovery process

(2) The stage of selecting the right data for a KDD process

(3) A subject-oriented integrated time variant non-volatile collection of data in support of management

(4) None of these

7. The need to synchronize data upon update is called ..... .

(1) Data Manipulation (2) Data Replication

(3) Data Coherency (4) Data Imitation

8. ..... can best be described as a programming model used to develop Hadoop-based applications that can process massive amounts of data.

(1) MapReduce (2) Mahout

(3) Oozie (4) All of the mentioned

9. The attribute AGE is calculated from DATE_OF _BIRTH. The attribute AGE is ..... .

(1) Single valued (2) Multi valued (3) Composite (4) Derived

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10. Which of the following is a NoSQL Database Type ?

(1) SQL
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13. Let swap ( ) be a function that swaps two elements using their addresses. Consider the following C function :

```
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14. What is the return value of f(p, p), if the value of p is initialized to 5 before the call? Note that the first parameter is passed by reference, whereas the second parameter is passed by value :

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15. Which of the following is used to open document in new window ?

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i. Servlets execute on Server; Applets execute on browser

ii. Servlets have no GUI; Applet has GUI

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(1) i, ii, iii are correct (2) i, ii are correct

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17. The transformation in which an object can be shifted to any coordinate position in three dimensional plane are called :

(1) Translation (2) Scaling

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18. While inheriting a class, if no access mode is specified, then which among the following is ***true*** ? (in C++)

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(2) X – (i), Y – (iii), Z– (ii)

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20. fseek( ) should be preferred over rewind( ) mainly because :

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21. The police arrested four criminals - P, Q, R and S. The criminals knew each other. They made the following statements :

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22. In a college, there are three student clubs, Sixty students are only in the Drama club, 80 students are only in the Dance club, 30 students are only in Maths club, 40 students are in both Drama and Dance clubs, 12 students are in both Dance and Maths clubs, 7 students are in both Drama and Maths clubs, and 2 students are in all clubs. If 75% of the students in the college are not in any of these clubs, then the total number of students in the college is ..... :

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25. Let $A = \{1,2,3\}$. Then number of relations containing (1, 2) and (1, 3) which are reflexive and symmetric but not transitive are :

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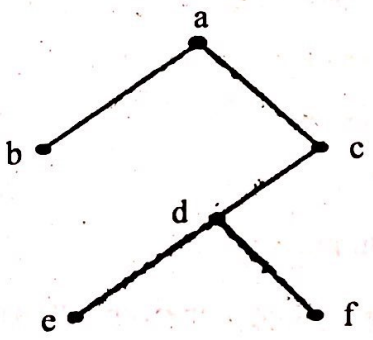

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(2) b e f d c a; a b c d e f
(3) a b c d e f; b e f d c a
(4) a b c d e f; f e d c b a

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28. In graphical solutions of linear inequalities, solution can be divided into :

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29. According to system of constraints, solution set graphical representation is classified as :

(1) region of ordinate solutions (2) region of intercept solutions

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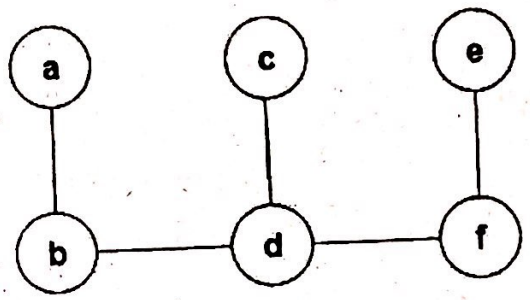
30. How many Hamiltonian paths does the following graph have ?



(1) 1 (2) 2 (3) 0 (4) 3

31. Consider that 15 machines need to be connected in a LAN using 8-port Ethernet switches. Assume that these switches do not have any separate up link ports. The minimum number of switches needed is ..... .

(1) 3 (2) 4 (3) 5 (4) 6

32. An analog signal carries four bits in each signal element. Find the baud rate and bit rate, if 2000 signal elements are sent per second :

(1) 2000bauds per sec, 8000bps

(2) 8000bauds per sec, 2000bps

(3) 2000bauds per sec, 2000bps

(4) 8000bauds per sec, 8000bps

33. Using Cyclic Redundancy Check (CRC), find what is the dividend at the receiver, if the data unit is 111111 and the divisor is 1010 ?

(1) 111111011 (2) 111111110 (3) 1010110 (4) 110111111

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34. In the IPv4 addressing format, the number of networks allowed under Class C addresses is :

(1) 2^{14} (2) 2^{7} (3) 2^{21} (4) 2^{24}

35. What is the use of Ping command ?

(1) To know network speed

(2) To test storage device

(3) To test a host on the network is reachable

(4) None of the above

36. Which layer is CoAP ?

(1) Control layer (2) Transport layer

(3) Service layer (4) Application layer

37. Which layer in OSI model is responsible for translation, encryption and compression of data ?

(1) Session layer (2) Application layer

(3) Presentation layer (4) Physical layer

38. The ..... protocol is used for the transmission of e-mails and ..... protocol is used by email programs to retrieve emails from an email server.

(1) POP, SMTP (2) SMTP, POP (3) SMTP, SMTP (4) POP, POP

39. Point out the ***correct*** statement with regard to Cloud Computing :

(1) Platforms can be based on specific types of development languages, application frameworks, or other constructs.

(2) SaaS is the cloud-based equivalent of shrink-wrapped software.

(3) Software as a Service (SaaS) may be succinctly described as software that is deployed on a hosted service.

(4) All of the mentioned.

40. In IoT, MQTT is ..... oriented.

(1) Data (2) Message (3) Network (4) Device

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41. Which one of the following is ***not*** desired in a good Software Requirement Specifications (SRS) document ?

(1) Functional Requirements

(2) Non-Functional Requirements

(3) Goals of Implementation

(4) Algorithms for Software Implementation

42. The Phases of formal review process, in software engineering are mentioned below. Arrange them in the ***correct*** order :

i. Planning

ii. Review Meeting

iii. Rework

iv. Individual Preparations

v. Kick Off

vi. Follow Up

(1) i, ii, iii, iv, v, vi

(2) vi, i, ii, iii, iv, v

(3) i, v, iv, ii, iii, vi

(4) i, ii, iii, v, iv, vi

43. System architecture is determined during which phase ?

(1) Requirement gathering

(2) Implementation

(3) Development

(4) Design

44. Component testing is a :

(1) Black box testing

(2) White box testing

(3) Grey box testing

(4) Both (1) and (2)

45. The objective of software project planning is to :

(1) Convince the customer that a project is feasible

(2) Make use of historical project data

(3) Enable a manager to make reasonable estimates of cost and schedule

(4) Determine the probable profit margin prior to bidding on a project

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46. In Software Engineering which is ***not*** an element of requirement model ?

(1) Behavioural elements (2) Class based elements

(3) Data elements (4) Scenario based elements

47. The model which estimates the total effort in terms of person, months of the technical project staff is ..... .

(1) Spiral Model (2) Waterfall model

(3) Win-win spiral model (4) COCOMO Model

48. Agile Modelling (AM) provides guidance to practitioner during which of these software tasks ?

(1) Analysis (2) Design

(3) Testing (4) Both 1 and 2

49. Read the columns and match the following :

(a) Data coupling	(i) Module A and Module B have shared data.
(b) Stamp coupling	(ii) Dependency between modules is based on the fact they communicate by only passing of data.
(c) Common coupling	(iii) When complete data structure is passed from one module to another.
(d) Content coupling	(iv) When the control is passed from one module to the middle of another.

(1) a - iii, b - ii, c - i, d - iv (2) a - ii, b - iii, c - i, d - iv

(3) a - ii, b - iii, c - iv, d - i (4) a - iii, b - ii, c - iv, d - i

50. Which of the following is ***not*** included in the Software requirements specification document ?

(1) Functional Requirements

(2) Non- functional requirements

(3) Goals of implementation

(4) User Manual

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51. One of the main challenge/s of NLP is ..... .

(1) Handling Ambiguity of Sentences

(2) Handling Tokenization

(3) Handling POS- Tagging

(4) All of the mentioned

52. What is state space ?

(1) The whole problem

(2) Your Definition to a problem

(3) Problem you design

(4) Representing your problem with variable and parameter

53. Which search is similar to min-max search ?

(1) Hill-climbing search

(2) Depth-first search

(3) Breadth-first search

(4) All of the mentioned

54. A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalization, the output will be zero when and only when the input is :

(1) 000 or 110 or 011 or 101

(2) 010 or 100 or 110 or 101

(3) 000 or 010 or 110 or 100

(4) 100 or 111 or 101 or 001

55. The truth values of traditional set theory is ..... and that of fuzzy set is ..... .

(1) Either 0 or 1, between 0 & 1

(2) Between 0 & 1, either 0 or 1

(3) Between 0 & 1, between 0 & 1

(4) Either 0 or 1, either 0 or 1

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56. Which of the following statement(s) is/are ***true*** for Gradient Decent (GD) and Stochastic Gradient Decent (SGD) ?

a. In GD and SGD, you update a set of parameters in an iterative manner to minimize the error function.

b. In SGD, you have to run through all the samples in your training set for a single update of a parameter in each iteration.

c. In GD, you either use the entire data or a subset of training data to update a parameter in each iteration.

(1) Only a (2) Only b (3) Only c (4) a, b and c

57. In hopfield network with symmetric weights, energy at each state may ?

(1) increase (2) decrease

(3) decrease or remain same (4) decrease or increase

58. In which of the following learning techniques, the teacher returns reward and punishment to learner ?

(1) Active learning (2) Reinforcement learning

(3) Supervised learning (4) Unsupervised learning

59. ..... algorithm(s) is used to extract the plan directly from the planning graph, rather than using graph to provide heuristic.

(1) BFS/DFS (2) A* (3) Graph-Plan (4) Greedy

60. Inference algorithm is complete only if :

(1) It can derive any sentence

(2) It can derive any sentence that is an entailed version

(3) It is truth preserving

(4) It can derive any sentence that is an entailed version & It is truth preserving

61. Which one of the following statements is ***not*** correct about the B+ tree data structure used for creating an index of a relational database table ?

(1) B+ Tree is a height-balanced tree

(2) Non-leaf nodes have pointers to data records

(3) Key values in each node are kept in sorted order

(4) Each leaf node has a pointer to the next leaf node

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62. Select the ***correct*** asymptotic complexity of an algorithm with runtime T(n, n) where

$T(x, c) = \Theta(x)$ for $c <= 2$,

$T(c, y) = \Theta(y)$ for $c <= 2$, and

$T(x, y) = \Theta(x+y) + T(x/2, y/2)$

(1) $\Theta(n\text{Log}n)$ (2) $\Theta(n^2)$ (3) $\Theta(n)$ (4) $\Theta(n^2\text{Log}n)$

63. Which of the following changes to QuickSort algorithm will improve its performance on average and are generally done in practice ?

A. Randomly picking up to make worst case less likely to occur.

B. Calling insertion sort for small sized arrays to reduce recursive calls.

C. QuickSort is tail recursive, so tail call optimizations can be done.

D. A linear time median searching algorithm is used to pick the median, so that the worst case time reduces to $O(n \text{Log}_n)$

(1) A and B (2) B, C and D (3) A, B and C (4) B, C and D

64. The number of elements that can be sorted in (log n) time using heap sort is :

A. $\Theta(1)$ B. $\Theta\left(\sqrt{\log n}\right)$ C. $\Theta\left(\frac{\log n}{\log\log n}\right)$ D. $\Theta(\log n)$

(1) A (2) B (3) C (4) D

65. Consider a complete graph G with 4 vertices. The graph G has ..... spanning trees.

(1) 15 (2) 8 (3) 16 (4) 13

66. ..... solves the problem of finding the shortest path from a point in a graph to a destination.

(1) Kruskal's algorithm (2) Prim's algorithm

(3) Dijkstra algorithm (4) Bellman ford algorithm

67. The number of comparisons done by sequential search is :

(1) $(N/2) - 1$ (2) $(N + 1)/2$ (3) $(N - 1)/2$ (4) $(N + 2)/2$

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68. Consider the tree arcs of a BFS traversal from a source node W in an unweighted, connected, undirected graph. The tree T formed by the tree arcs is a data structure for computing :

(1) the shortest path between every pair of vertices.

(2) the shortest path from W to every vertex in the graph.

(3) the shortest paths from W to only those nodes that are leaves of T.

(4) the longest path in the graph.

69. 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 :

(1) 3, 0, and 1 (2) 3, 3, and 3 (3) 4, 0, and 1 (4) 3, 0, and 2

70. A B-tree of order 4 and of height 3 will have a maximum of ..... keys.

(1) 255 (2) 63 (3) 127 (4) 188

71. Consider the following grammar :

$P \rightarrow x\ Q\ R\ S$

$Q \rightarrow y\ z \mid z$

$R \rightarrow w \mid \varepsilon$

$S \rightarrow y$

What is FOLLOW (Q) ?

(1) {R} (2) {w} (3) {w, y} (4) {w, $}

72. Pushdown machine represents :

(1) Type 3 regular grammar (2) Type 2 context free grammar

(3) Type 1 Context sensitive grammar (4) Type 0 grammar

73. The languages generated by Turing machine are :

(1) Recursively enumerable languages (2) Regular languages

(3) Regular expression (4) Context free languages

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74. Any strings of terminals that can be generated by CFG is :

$S \rightarrow XY$

$X \rightarrow aX \mid bX \mid a$

$Y \rightarrow Ya \mid Yb \mid b$

(1) has at least one b
(2) should end by 'a'
(3) has no consecutive a's or b's
(4) has at least 2a's

75. In a compiler, keywords of a language are recognized during :

(1) parsing of the program
(2) the code generation
(3) the lexical analysis of the program
(4) dataflow analysis

76. Match all items in **Group 1** with ***correct*** options from those given in **Group 2** :

Group 1	**Group 2**
P. Regular expression	(i) Syntax analysis
Q. Pushdown automata	(ii) Code generation
R. Dataflow analysis	(iii) Lexical analysis
S. Register allocation	(iv) Code optimization

(1) P-(iv) Q-(i), R-(ii), S-(iii)
(2) P-(iii), Q-(i), R-(iv), S-(ii)
(3) P-(iii), Q-(iv), R-(i), S-(ii)
(4) P-(ii), Q-(i), R-(iv), S-(iii)

77. An LALR(I) parser for a grammar G can have shift-reduce (S-R) conflicts if and only if :

(1) the SLR(1) parser for G has S-R conflicts
(2) the LR(1) parser for G has S-R conflicts
(3) the LR(0) parser for G has S-R conflicts
(4) the LALR(1) parser for G has reduce-reduce conflicts

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78. Rahul, Mohan, Srinivas and Arun are seated around a square table. Rahul is sitting to the left of Mohan. Srinivas is sitting to the right of Arun. Which of the following pairs are seated opposite each other ?

(1) Rahul and Mohan
(2) Srinivas and Arun
(3) Srinivas and Mohan
(4) Srinivas and Rahul

79. Consider the following languages :

$L_1 = \{0^p 1^q 0^r \mid p,q,r \geq 0\}$

$L_2 = \{0^p 1^q 0^r \mid p,q,r \geq 0,\ p \neq r\}$

Which one of the following statements is ***false*** ?

(1) L_2 is context-free

(2) L_1 intersection L_2 is context-free

(3) Complement of L_2 is recursive

(4) Complement of L_1 is context-free but not regular

80. Resolution of externally defined symbols is performed by :

(1) Linker (2) Loader (3) Compiler (4) Interpreter

81. Which one of the following electronic circuits can be used to store 1 bit of data ?

(1) Encoder (2) OR gate (3) Flip flop (4) Decoder

82. In 16-bit 2's complement representation, the decimal number –20 is :

(1) 1111 1111 0001 0100
(2) 0000 0000 1110 0100
(3) 1111 1111 1110 1100
(4) 1000 0000 1110 0100

83. When an interrupt occurs, which one of the following takes place ?

(1) Execution of the current instruction is completed and the address of the next instruction is saved before the interrupt service program starts

(2) Execution of the current instruction is aborted and its address is saved before the interrupt service program starts

(3) Execution of the current instruction is completed and the interrupt service program starts

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84. Which one of the following is the ***correct*** arrangement of the ease of programming (from easiest to hardest) of various programming languages ?

(1) Binary machine code, hex code, assembly, high level language

(2) Binary machine code, assembly, hex code, high level language

(3) High level language, assembly, hex code, Binary machine code

(4) High level language, hex code, assembly, Binary machine code

85. Which one of the following is a valid comparison of the characteristics of an RISC and a CISC computer ?

(1) CISC computers exhibit better performance than RISC computers because complex instructions get executed in hardware.

(2) For the same program, a compiler generates more number of CISC instructions than RISC instructions.

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(3) Hardware interrupt driven I/O

(4) Software interrupt driven

87. A ROM is used to store the multiplication table of two 8 bit unsigned integers. What would be the size of required ROM ?

(1) 64K X 16bits (2) 16K X 8bits (3) 256 X 16 bits (4) 32K X 8bits

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88. If four processors are to be interconnected with three memory modules using a crossbar interconnection, what is the minimum number of switches required ?
(1) 7 (2) 12 (3) 16 (4) 17

89. Distributed computers belong to which one of the following classes of computers ?
(1) SISD (2) SIMD (3) MIMD (4) MISD

90. What is the minimum number of 2-input NOR gates required to implement 4-variable function expressed in sum-of-minterms from as $f = \Sigma (0, 2, 5, 7, 8, 10, 13, 15)$? Assume that all the inputs and their complements are available.
(1) 3 (2) 4 (3) 5 (4) 6

91. A scheduling algorithm assigns priority proportional to the waiting time of a process. Every process starts with priority zero (the lowest priority). The scheduler re-evaluates the process priorities every T time units and decides the next process to schedule. Which one of the following is ***true*** if the processes have no I/O operations and all arrive at time zero ?
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(1) Does not maintain a separate stack
(2) Maintains only CPU register state
(3) Does not maintain a virtual memory state
(4) Maintains only scheduling and accounting information

93. Which of the following statements are ***true*** ?
(1) Shortest remaining time first scheduling may cause starvation
(2) Starvation may be caused by pre-emptive scheduling.
(3) In terms of response time robin round is better than FCFS
(4) All of the above statements are true

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94. Which of the following statements is ***true*** for the dirty page in a page table ?

(1) Helps to maintain LRU information

(2) Allows only read on a page

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```
Process P0
while(true)
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    wait(S0);
    print '0';
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}

Process PI
waite(S1);
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Process P2
wait(S2);
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```

How many times will P0 print '0'?

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(2) Exactly twice

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96. .....is not possible in distributed file system.

(1) File replication (2) Migration

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(3) hash key (4) asymmetric-key

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D

SET-Z

M.Phil./Ph.D./URS-EE-2019

SUBJECT : Computer Science

10036

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name_____

Mother's Name_____ Date of Examination_____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination..*

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(1) 3 (2) 4 (3) 5 (4) 6

11. Consider that 15 machines need to be connected in a LAN using 8-port Ethernet switches. Assume that these switches do not have any separate up link ports. The minimum number of switches needed is .....

(1) 3 (2) 4 (3) 5 (4) 6

12. An analog signal carries four bits in each signal element. Find the baud rate and bit rate, if 2000 signal elements are sent per second :

(1) 2000bauds per sec, 8000bps

(2) 8000bauds per sec, 2000bps

(3) 2000bauds per sec, 2000bps

(4) 8000bauds per sec, 8000bps

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13. Using Cyclic Redundancy Check (CRC), find what is the dividend at the receiver, if the data unit is 111111 and the divisor is 1010 ?

(1) 111111011 (2) 111111110

(3) 1010110 (4) 110111111

14. In the IPv4 addressing format, the number of networks allowed under Class C addresses is :

(1) 2^{14} (2) 2^{7} (3) 2^{21} (4) 2^{24}

15. What is the use of Ping command ?

(1) To know network speed

(2) To test storage device

(3) To test a host on the network is reachable

(4) None of the above

16. Which layer is CoAP ?

(1) Control layer (2) Transport layer

(3) Service layer (4) Application layer

17. Which layer in OSI model is responsible for translation, encryption and compression of data ?

(1) Session layer (2) Application layer

(3) Presentation layer (4) Physical layer

18. The ..... protocol is used for the transmission of e-mails and ..... protocol is used by email programs to retrieve emails from an email server.

(1) POP, SMTP (2) SMTP, POP

(3) SMTP, SMTP (4) POP, POP

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19. Point out the ***correct*** statement with regard to Cloud Computing :

(1) Platforms can be based on specific types of development languages, application frameworks, or other constructs.

(2) SaaS is the cloud-based equivalent of shrink-wrapped software.

(3) Software as a Service (SaaS) may be succinctly described as software that is deployed on a hosted service.

(4) All of the mentioned.

20. In IoT, MQTT is ..... oriented.

(1) Data (2) Message (3) Network (4) Device

21. Which one of the following statements is ***not*** correct about the B+ tree data structure used for creating an index of a relational database table ?

(1) B+ Tree is a height-balanced tree

(2) Non-leaf nodes have pointers to data records

(3) Key values in each node are kept in sorted order

(4) Each leaf node has a pointer to the next leaf node

22. Select the ***correct*** asymptotic complexity of an algorithm with runtime T(n, n) where

$T(x, c) = \Theta(x)$ for $c <= 2$,

$T(c, y) = \Theta(y)$ for $c <= 2$, and

$T(x, y) = \Theta(x+y) + T(x/2, y/2)$

(1) $\Theta(nLogn)$ (2) $\Theta(n^2)$ (3) $\Theta(n)$ (4) $\Theta(n^2Logn)$

23. Which of the following changes to QuickSort algorithm will improve its performance on average and are generally done in practice ?

A. Randomly picking up to make worst case less likely to occur.

B. Calling insertion sort for small sized arrays to reduce recursive calls.

C. QuickSort is tail recursive, so tail call optimizations can be done.

D. A linear time median searching algorithm is used to pick the median, so that the worst case time reduces to $O(n \text{ Log}_n)$

(1) A and B (2) B, C and D (3) A, B and C (4) B, C and D

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24. The number of elements that can be sorted in (log n) time using heap sort is :

A. $\Theta(1)$ B. $\Theta(\sqrt{\log n})$ C. $\Theta\left(\frac{\log n}{\log\log n}\right)$ D. $\Theta(\log n)$

(1) A (2) B (3) C (4) D

25. Consider a complete graph G with 4 vertices. The graph G has ..... spanning trees.

(1) 15 (2) 8 (3) 16 (4) 13

26. ..... solves the problem of finding the shortest path from a point in a graph to a destination.

(1) Kruskal's algorithm (2) Prim's algorithm

(3) Dijkstra algorithm (4) Bellman ford algorithm

27. The number of comparisons done by sequential search is :

(1) $(N/2) - 1$ (2) $(N + 1)/2$

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41. One of the main challenge/s of NLP is ..... .

(1) Handling Ambiguity of Sentences

(2) Handling Tokenization

(3) Handling POS- Tagging

(4) All of the mentioned

42. What is state space ?

(1) The whole problem

(2) Your Definition to a problem

(3) Problem you design

(4) Representing your problem with variable and parameter

43. Which search is similar to min-max search ?

(1) Hill-climbing search

(2) Depth-first search

(3) Breadth-first search

(4) All of the mentioned

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44. A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalization, the output will be zero when and only when the input is :

(1) 000 or 110 or 011 or 101

(2) 010 or 100 or 110 or 101

(3) 000 or 010 or 110 or 100

(4) 100 or 111 or 101 or 001

45. The truth values of traditional set theory is ..... and that of fuzzy set is ..... .

(1) Either 0 or 1, between 0 & 1

(2) Between 0 & 1, either 0 or 1

(3) Between 0 & 1, between 0 & 1

(4) Either 0 or 1, either 0 or 1

46. Which of the following statement(s) is/are ***true*** for Gradient Decent (GD) and Stochastic Gradient Decent (SGD) ?

a. In GD and SGD, you update a set of parameters in an iterative manner to minimize the error function.

b. In SGD, you have to run through all the samples in your training set for a single update of a parameter in each iteration.

c. In GD, you either use the entire data or a subset of training data to update a parameter in each iteration.

(1) Only a (2) Only b (3) Only c (4) a, b and c

47. In hopfield network with symmetric weights, energy at each state may ?

(1) increase (2) decrease

(3) decrease or remain same (4) decrease or increase

48. In which of the following learning techniques, the teacher returns reward and punishment to learner ?

(1) Active learning (2) Reinforcement learning

(3) Supervised learning (4) Unsupervised learning

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49. ..... algorithm(s) is used to extract the plan directly from the planning graph, rather than using graph to provide heuristic.

(1) BFS/DFS
(2) A*
(3) Graph-Plan
(4) Greedy

50. Inference algorithm is complete only if :

(1) It can derive any sentence
(2) It can derive any sentence that is an entailed version
(3) It is truth preserving
(4) It can derive any sentence that is an entailed version & It is truth preserving

51. In orthographic projection, the object is placed with one of its faces ..... to the picture plane.

(1) Inclined
(2) Perpendicular
(3) Parallel
(4) Any of the above

52. The intersection of primary ROB colours and primary CMYK colours produces ..... and ..... colour respectively

(1) White colour, White colour
(2) White colour, Black colour
(3) Black colour, White colour
(4) Black colour, Black colour

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53. Let swap ( ) be a function that swaps two elements using their addresses. Consider the following C function :

```
void fun(int arr[ ], int n)
{
    for (int i = 0; i < n; i + = 2)
    {
        if (i > 0 && arr[i – 1] > arr[i] )
            swap(&arr[i], &arr[i-1]);
        if (i < n – 1 && arr[i] < arr[i + 1] )
            swap(&arr[i], &arr[i + 1]);
    }
}
```

If an array {10, 20, 30, 40, 50, 60, 70, 80} is passed to the function, the array is changed to :

(1) {20, 10, 40, 30, 60, 50, 80, 70}
(2) {10, 30, 20, 40,60, 50, 80, 70}
(3) {10, 20, 30, 40, 50, 60, 70, 80}
(4) {80, 70, 60, 50, 40, 30, 20, 10}

54. What is the return value of f(p, p), if the value of p is initialized to 5 before the call? Note that the first parameter is passed by reference, whereas the second parameter is passed by value :

```
int (int &x, int c) {
    c = c – l;
    if (c == 0) return 1;
    x = x + 1;
    return f(x, c) * x;
}
```

(1) 3024
(2) 6561
(3) 55440
(4) 161051

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55. Which of the following is used to open document in new window ?

(1) Link
(2) Link
(3) Link
(4) Link

56. What is the difference between servlets and applets ?

i. Servlets execute on Server; Applets execute on browser
ii. Servlets have no GUI; Applet has GUI
iii. Servlets creates static web pages; Applets creates dynamic web pages
iv. Servlets can handle only a single request; Applet can handle multiple requests

(1) i, ii, iii are correct
(2) i, ii are correct
(3) i, iii are correct
(4) i, ii, iii, iv are correct

57. The transformation in which an object can be shifted to any coordinate position in three dimensional plane are called :

(1) Translation (2) Scaling (3) Rotation (4) All of these

58. While inheriting a class, if no access mode is specified, then which among the following is ***true*** ? (in C++)

(1) It gets inherited publicly by default
(2) It gets inherited protected by default
(3) It gets inherited privately by default
(4) It is not possible

59. The most appropriate matching for the following pairs is :

X : Indirect addressing
Y : Imeediate addressing
Z : Auto decrement addressing

(i) : Loops
(ii) : Pointers
(iii) : Constants

(1) X – (iii), Y – (ii), Z– (i)
(2) X – (i), Y – (iii), Z– (ii)
(3) X – (ii), Y – (iii), Z– (i)
(4) X – (iii), Y – (i), Z– (ii)

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60. fseek( ) should be preferred over rewind( ) mainly because :
(1) rewind( ) doesn't work for empty files
(2) rewind( ) may fail for large files
(3) In rewind, there is no way to check if the operations completed successfully
(4) All of the above

61. Database : In second normal form .....
(1) A composite attributes is converted to individual attributes.
(2) Non key attributes are functionally dependent on key attributes.
(3) The non key attributes functionally dependent not on a part of key attributes.
(4) All the above.

62. What stores the metadata about the structure of the database, in particular the schema of the database ?
(1) Indices
(2) Database log
(3) Data files
(4) Data Dictionary

63. Consider the following Employee table :

ID	salary	DeptName
1	10000	EC
2	40000	EC
3	30000	CS
4	40000	ME
5	50000	ME
6	60000	ME
7	70000	CS

How many rows are there in the result of following query ?

```
SELECT E.ID
FROM Employee E
WHERE EXISTS (SELECT E2.salary
    FROM Employee E2
    WHERE E2.DeptName = 'CS'
    AND E.salary> E2.salary)
```

(1) 0 (2) 4 (3) 5 (4) 6

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64. In DBMS, index is clustered, if :
(1) it is on a set of fields that form a candidate key.
(2) it is on a set of fields that include the primary key.
(3) the data records of the file are organized in the same order as the data entries of the index.
(4) the data records of the file are organized not in the same order as the data entries of the index.

65. Which of the following statement is ***true*** for the "Reconciled data" ?
(1) Data stored in the various operational systems throughout the organization.
(2) Current data intended to be the single source for all decision support systems.
(3) Data stored in one operational system in the organization.
(4) Data that has been selected and formatted for end-user support applications.

66. Data warehouse is :
(1) The actual discovery phase of a knowledge discovery process
(2) The stage of selecting the right data for a KDD process
(3) A subject-oriented integrated time variant non-volatile collection of data in support of management
(4) None of these

67. The need to synchronize data upon update is called ..... .
(1) Data Manipulation (2) Data Replication
(3) Data Coherency (4) Data Imitation

68. ..... can best be described as a programming model used to develop Hadoop-based applications that can process massive amounts of data.
(1) MapReduce (2) Mahout
(3) Oozie (4) All of the mentioned

69. The attribute AGE is calculated from DATE_OF _BIRTH. The attribute AGE is ..... .
(1) Single valued (2) Multi valued (3) Composite (4) Derived

70. Which of the following is a NoSQL Database Type ?
(1) SQL (2) Document databases
(3) JSON (4) All of the mentioned

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71. Which one of the following is ***not*** desired in a good Software Requirement Specifications (SRS) document ?

(1) Functional Requirements

(2) Non-Functional Requirements

(3) Goals of Implementation

(4) Algorithms for Software Implementation

72. The Phases of formal review process, in software engineering are mentioned below. Arrange them in the ***correct*** order :

i. Planning

ii. Review Meeting

iii. Rework

iv. Individual Preparations

v. Kick Off

vi. Follow Up

(1) i, ii, iii, iv, v, vi

(2) vi, i, ii, iii, iv, v

(3) i, v, iv, ii, iii, vi

(4) i, ii, iii, v, iv, vi

73. System architecture is determined during which phase ?

(1) Requirement gathering

(2) Implementation

(3) Development

(4) Design

74. Component testing is a :

(1) Black box testing

(2) White box testing

(3) Grey box testing

(4) Both (1) and (2)

75. The objective of software project planning is to :

(1) Convince the customer that a project is feasible

(2) Make use of historical project data

(3) Enable a manager to make reasonable estimates of cost and schedule

(4) Determine the probable profit margin prior to bidding on a project

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76. In Software Engineering which is ***not*** an element of requirement model ?

(1) Behavioural elements (2) Class based elements

(3) Data elements (4) Scenario based elements

77. The model which estimates the total effort in terms of person, months of the technical project staff is ..... .

(1) Spiral Model (2) Waterfall model

(3) Win-win spiral model (4) COCOMO Model

78. Agile Modelling (AM) provides guidance to practitioner during which of these software tasks ?

(1) Analysis (2) Design

(3) Testing (4) Both 1 and 2

79. Read the columns and match the following :

(a) Data coupling	(i) Module A and Module B have shared data.
(b) Stamp coupling	(ii) Dependency between modules is based on the fact they communicate by only passing of data.
(c) Common coupling	(iii) When complete data structure is passed from one module to another.
(d) Content coupling	(iv) When the control is passed from one module to the middle of another.

(1) a - iii, b - ii, c - i, d - iv (2) a - ii, b - iii, c - i, d - iv

(3) a - ii, b - iii, c - iv, d - i (4) a - iii, b - ii, c - iv, d - i

80. Which of the following is ***not*** included in the Software requirements specification document ?

(1) Functional Requirements

(2) Non- functional requirements

(3) Goals of implementation

(4) User Manual

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81. The police arrested four criminals - P, Q, R and S. The criminals knew each other. They made the following statements :

P says "Q committed the crime."

Q says "S committed the crime."

R says" I did not do it."

S says "What Q said about me is false."

Assume only one of the arrested four committed the crime and only one of the statements made above is true. Who committed the crime ?

(1) P (2) R (3) S (4) Q

82. In a college, there are three student clubs, Sixty students are only in the Drama club, 80 students are only in the Dance club, 30 students are only in Maths club, 40 students are in both Drama and Dance clubs, 12 students are in both Dance and Maths clubs, 7 students are in both Drama and Maths clubs, and 2 students are in all clubs. If 75% of the students in the college are not in any of these clubs, then the total number of students in the college is ..... :

(1) 1000 (2) 975 (3) 900 (4) 225

83. The random experiment is rolling a pair of six sided dice. Compute the probability of the sum of two dice being 8.

(1) 5/36 (2) 7/36 (3) 6/36 (4) 8/36

84. Let G be an undirected complete graph on n vertices, where $n > 2$. Then, the number of different Hamiltonian cycles in G is equal to :

(1) $n!$ (2) $n-1!$ (3) 1 (4) $(n-1)!/2$

85. Let $A = \{1,2,3\}$. Then number of relations containing (1, 2) and (1, 3) which are reflexive and symmetric but not transitive are :

(1) 1 (2) 2 (3) 3 (4) 4

86. How many distinct binary functions of order 3 are there ?

(1) 32 (2) 256 (3) 64 (4) 128

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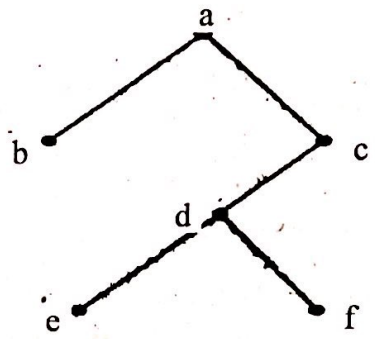
87. In the given tree list the order that the nodes are processed using preorder and postorde are :

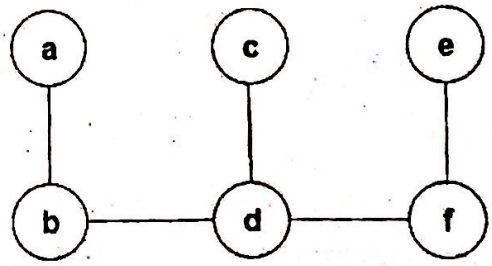


(1) b e f d c a; a c d f e b
(2) b e f d c a; a b c d e f
(3) a b c d e f; b e f d c a
(4) a b c d e f; f e d c b a

88. In graphical solutions of linear inequalities, solution can be divided into :
(1) one subset (2) two subsets (3) three subsets (4) four subsets

89. According to system of constraints, solution set graphical representation is classified as :
(1) region of ordinate solutions
(2) region of intercept solutions
(3) region of vertex solutions
(4) region of feasible solutions

90. How many Hamiltonian paths does the following graph have ?



(1) 1 (2) 2 (3) 0 (4) 3

91. Consider the following grammar :

$P \rightarrow x\ Q\ R\ S$

$Q \rightarrow y\ z \mid z$

$R \rightarrow w \mid \varepsilon$

$S \rightarrow y$

What is FOLLOW (Q) ?

(1) {R} (2) {w} (3) {w, y} (4) {w, $}

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92. Pushdown machine represents :

(1) Type 3 regular grammar
(2) Type 2 context free grammar
(3) Type 1 Context sensitive grammar
(4) Type 0 grammar

93. The languages generated by Turing machine are :

(1) Recursively enumerable languages
(2) Regular languages
(3) Regular expression
(4) Context free languages

94. Any strings of terminals that can be generated by CFG is :

$S \rightarrow XY$

$X \rightarrow aX \mid bX \mid a$

$Y \rightarrow Ya \mid Yb \mid b$

(1) has at least one b
(2) should end by 'a'
(3) has no consecutive a's or b's
(4) has at least 2a's

95. In a compiler, keywords of a language are recognized during :

(1) parsing of the program
(2) the code generation
(3) the lexical analysis of the program
(4) dataflow analysis

96. Match all items in **Group 1** with ***correct*** options from those given in **Group 2** :

Group 1	**Group 2**
P. Regular expression	(i) Syntax analysis
Q. Pushdown automata	(ii) Code generation
R. Dataflow analysis	(iii) Lexical analysis
S. Register allocation	(iv) Code optimization

(1) P-(iv) Q-(i), R-(ii), S-(iii)
(2) P-(iii), Q-(i), R-(iv), S-(ii)
(3) P-(iii), Q-(iv), R-(i), S-(ii)
(4) P-(ii), Q-(i), R-(iv), S-(iii)

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97. An LALR(I) parser for a grammar G can have shift-reduce (S-R) conflicts if and only if :

(1) the SLR(1) parser for G has S-R conflicts

(2) the LR(1) parser for G has S-R conflicts

(3) the LR(0) parser for G has S-R conflicts

(4) the LALR(1) parser for G has reduce-reduce conflicts

98. Rahul, Mohan, Srinivas and Arun are seated around a square table. Rahul is sitting to the left of Mohan. Srinivas is sitting to the right of Arun. Which of the following pairs are seated opposite each other ?

(1) Rahul and Mohan (2) Srinivas and Arun

(3) Srinivas and Mohan (4) Srinivas and Rahul

99. Consider the following languages :

$L_1 = \{0^p 1^q 0^r \mid p,q,r \geq 0\}$

$L_2 = \{0^p 1^q 0^r \mid p,q,r \geq 0,\ p \neq r\}$

Which one of the following statements is ***false*** ?

(1) L_2 is context-free

(2) L_1 intersection L_2 is context-free

(3) Complement of L_2 is recursive

(4) Complement of L_1 is context-free but not regular

100. Resolution of externally defined symbols is performed by :

(1) Linker (2) Loader (3) Compiler (4) Interpreter

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Answer Key of M.Phil/Ph.D 2019 (Computer Science Engineering / Computer Science)				
Sr. No.	Set A	Set B	Set C	Set D
1	2	2	2	3
2	3	3	4	3
3	1	3	3	1
4	4	3	3	3
5	1	3	2	4
6	2	3	3	1
7	3	2	3	3
8	2	2	1	2
9	4	1	4	3
10	3	1	2	1
11	3	2	3	1
12	3	4	2	1
13	1	4	1	2
14	3	3	2	3
15	4	1	2	3
16	1	2	2	3
17	3	1	1	3
18	2	4	3	2
19	3	1	3	4
20	1	4	3	2
21	3	1	2	2
22	2	4	3	3
23	1	2	1	3
24	2	3	4	3
25	2	1	1	3
26	2	1	2	3
27	1	3	3	2
28	3	2	2	2
29	3	3	4	1
30	3	4	3	1
31	1	3	1	2
32	4	3	1	4
33	2	1	2	4
34	3	3	3	3
35	1	4	3	1
36	1	1	3	2
37	3	3	3	1
38	2	2	2	4
39	3	3	4	1
40	4	1	2	4
41	2	1	4	1
42	4	1	3	4
43	3	2	4	2
44	3	3	2	3
45	2	3	3	1
46	3	3	3	1
47	3	3	4	3
48	1	2	4	2
49	4	4	2	3
50	2	2	4	4
51	2	4	1	3
52	4	3	4	2
53	4	4	2	1
54	3	2	3	2

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55	1	3	1	2
56	2	3	1	2
57	1	4	3	1
58	4	4	2	3
59	1	2	3	3
60	4	4	4	3
61	4	3	2	2
62	3	2	3	4
63	4	1	3	3
64	2	4	3	3
65	3	3	3	2
66	3	2	3	3
67	4	2	2	3
68	4	3	2	1
69	2	4	1	4
70	4	1	1	2
71	2	2	3	4
72	3	4	2	3
73	3	3	1	4
74	3	3	4	2
75	3	2	3	3
76	3	3	2	3
77	2	3	2	4
78	2	1	3	4
79	1	4	4	2
80	1	2	1	4
81	3	3	3	2
82	2	2	3	3
83	1	1	1	1
84	4	2	3	4
85	3	2	4	1
86	2	2	1	2
87	2	1	3	3
88	3	3	2	2
89	4	3	3	4
90	1	3	1	3
91	1	2	2	3
92	1	3	4	2
93	2	1	4	1
94	3	4	3	4
95	3	1	1	3
96	3	2	2	2
97	3	3	1	2
98	2	2	4	3
99	4	4	1	4
100	2	3	4	1

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Dr. Kamaldeep

19/11/19.
Dr. Kamna

19/11/19.
Dr. Rajiv Nandal

19/11/19
Dr Balkishan

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