Sr. No. 4050

Ph.D. ENTRANCE TEST-2023

SUBJECT (COMPUTER SCIENCE)

Total Questions: 100
Time Allowed : 110 Minutes

Roll No. | | | | | | |

Instructions for Candidates

1. Write your roll number in the space provided at the top of this page of question booklet and fill up the necessary information in the spaces provided on OMR Answer sheet.
2. OMR Answer sheet has an original copy and a candidate's copy glued beneath it at the top. While making entries in the original copy, candidate should ensure that the two copies are aligned properly so that the entries made in the original copy against each item are exactly copied in the candidate's copy.
3. All entries in the OMR answers sheet including answers to questions are to be recorded in the original copy only.
4. Use only blue/ black ball point pen to darken the circle of correct / most appropriate response. In no ca gel/ ink pen or pencil should be used.
5. **Do not darken more the one circle of option for any question. A question with more than one darkene response shall be considered wrong.**
6. **There will be no "Negative Marking" for wrong answers.**
7. Only those candidates who would obtain positive score in entrance test examination shall be eligible for admission
8. Do not make any stray mark on the OMR sheet
9. Calculators and mobiles shall not be permitted inside the examination hall
10. Rough work, if any, should be done on the blank sheets provided with the question booklet.
11. OMR answer sheet must be handled carefully and it should not be folded or mutilated in such case it will not be evaluated.
12. Ensure that your OMR Answer sheet has been signed by the invigilator and the candidate himself/herself.
13. At the end of the examination hand over the OMR answer sheet to the invigilator who will first tear off the original OMR sheet in presence of the candidate and hand over the candidate's copy to the candidate.
14. If any of the information in the response sheet/question paper has been found missing or not mentioned as stated above the candidate is solely responsible for that lapse.

SEAL

Part I (General Aptitude 2023)

1. Tariq wants to sell a watch at a profit of 20%. He bought it at 10% less and sold it at ₹ 30 less, but still he gained 20%. The cost price of watch is.....

   A. ₹ 250
   B. ₹ 225
   C. ₹ 240
   D. ₹ 220

2. If today is Sunday then three days from now will be....

   A. Saturday
   B. Friday
   C. Thursday
   D. Wednesday

3. Absar is brother of Mehdi. Iqra is sister of Gulshan. Mehdi is son of Iqra. How is Absar related to Iqra?

   A. Son
   B. Brother
   C. Nephew
   D. Father

4. Ankit can do a piece of work in 6 days and Basharat in 9 days. How many days will both take together to complete the work?

   A. 7.5 days
   B. 5.4 days
   C. 3.6 days
   D. 3 days

5. The book "To Hell and Back: Humans of COVID" is authored by?

   A. Kavitha Iyer
   B. Jhumpa Lahiri
   C. Barkha Dutt
   D. Arundhati Roy

6. If PARTICLE is coded RCTVKENG, then how is SCIENCE coded?

   A. TBJUOMF
   B. TDJFODF
   C. UEKGPEG
   D. QBSUDMF

7. Where is the headquarter of the United Nations Environment Programme (UNEP) located?

   A. Nairobi, Kenya
   B. Venice, Italy
   C. Munich, Germany
   D. Geneva, Switzerland

8. Two years ago, Jane's age was three times Sam's age. If Jane is now 18, how old is Sam?

   A. 6 years
   B. 8 years
   C. 10 years
   D. 12 years

9. If WORK is coded as 4-12-9-16, then how will WOMAN be coded?

   A. 4-12-14-26-13
   B. 4-26-14-13-12
   C. 23-12-26-14-13
   D. 123-15-13-1-14

10. Which of the following states is not included in the sixth schedule of Indian Constitution?

    A. Meghalaya
    B. Tripura
    C. Mizoram
    D. Manipur

11. Letter : Word

A. Homework : School

B. Club : People

C. Product : Factory

D. Page : Book

12. The speed of a bus is 54 km/h if we don't let it stop at any point. If the bus stops at the bus-stops, the speed of the bus is 45 km/h. What is the time that the bus stops for per hour?

A. 7 mins

B. 10 mins

C. 21 mins

D. 22 mins

13. Blood does not coagulate inside the body due to the presence of _____?

A. Fibrin

B. Haemoglobin

C. Heparin

D. Plasma

14. If a triangle has angles measuring 30 degrees, 60 degrees, and 90 degrees, what type of triangle is it?

A. Equilateral

B. Isosceles

C. Scalene

D. Right-angled

15. The ..... of the Minister's statement cannot be verified by people who have no access to official records.

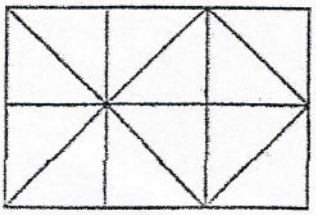
A. veracity

B. verbosity

C. ambiguity

D. validity

16. The number of squares in the given figure is.....



A. 7

B. 8

C. 9

D. 10

17. What is the percentage of profit if the cost price is 95% of the selling price?

A. 5%

B. 5.26%

C. 4%

D. 4.75%

18. If you start facing east and turn 135 degrees clockwise, which direction are you facing now?

A. North

B. West

C. North-East

D. South-East

19. Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) has been extended till which year recently?

A. 2025

B. 2028

C. 2030

D. 2032

20. Who is the present chairman of ISRO?

A. Sh. Heeralal Samariya

B. Sh. Harsh Chouhan

C. Sh. Ravneet Kaur

D. Sh. S Somanath

End of Part I

Part –II (Basic /Conventional questions

21. A vertex in a graph with degree equal to 1 is called as?
    a. Pendent vertex
    b. Isolated vertex
    c. One degree vertex
    d. None of the above
22. Which of the following is true?
    a. A "static" member of a class cannot be inherited by its derived class.
    b. A "static" member of a class can be initialized only within the class it is a member of.
    c. A "static" member of a class can be initialized before an object of that class is created.
    d. Since "static" member of a class is actually a global element, it does not require a class/object qualifier to access it independently of class/object.
23. Which of the relations on {0, 1, 2, 3} is an equivalence relation?
    a. { (0, 0) (0, 2) (2, 0) (2, 2) (2, 3) (3, 2) (3, 3) }
    b. { (0, 0) (1, 1) (2, 2) (3, 3) }
    c. { (0, 0) (0, 1) (0, 2) (1, 0) (1, 1) (1, 2) (2, 0) }
    d. { (0, 0) (0, 2) (2, 3) (1, 1) (2, 2) }
24. A simple graph G with '**n**' vertices (n>=3) has a Hamilton Circuit if and only the degree of every vertex in G is at least?
    a. n
    b. n+2
    c. n*2
    d. n/2
25. How many cards must be selected from a standard deck of 52 cards to guarantee that at least three diamonds are present among them?
    a. 09
    b. 42
    c. 17
    d. 49
26. The number of different binary trees with 4 nodes is?
    a. 8
    b. 12
    c. 14
    d. 16
27. Among 96 persons there are at least _____ persons who were born in the same month.
    a. 09
    b. 08
    c. 12
    d. 06
28. The chromatic number of a planar graph is no more than
    a. 2
    b. 4
    c. 6
    d. 8
29. Which of the following algorithm suffers from Belady's anoma'y?
    a. Optimal replacement
    b. LRU
    c. FIFO
    d. Both (a) and (c).
30. Dijkstra's algorithm is based on?
    a. Divide and conquer paradigm
    b. Dynamic programming
    c. Greedy Approach
    d. Backtracking paradigm

31. An algorithm must have---------- well-defined inputs
    a. 0
    b. 1
    c. 0 or more
    d. 1 or more
32. Which of the following is not a backtracking algorithm?
    a. Knight tour problem
    b. N queen problem
    c. Tower of Hanoi
    d. M coloring problem
33. Which of the following is an architectural attribute?
    a. Instruction set
    b. Addressing modes
    c. Both a & b
    d. None of the above
34. The term locality of reference is related to data transfer between?
    a. CPU & Cache Memory
    b. Main Memory & Cache Memory
    c. Secondary Memory & Main Memory
    d. None of the above
35. The hexadecimal equivalent of the octal number 2357 is?
    a. 2EE
    b. 2FF
    c. 4EF
    d. 4FE
36. The number of memory references to access the operand value in immediate addressing is?
    a. 0
    b. 1
    c. 2
    d. None of the above
37. Two atomic operations permissible on Semaphores are?
    a. wait, stop
    b. wait, hold
    c. hold, signal
    d. wait, signal
38. In which of the following scheduling criteria, context switching will never take place?
    a. ROUND ROBIN
    b. Preemptive SJF
    c. Non-preemptive SJF
    d. Preemptive priority
39. The main disadvantage of semaphores is that?
    a. They require large amount of memory
    b. They are very hard to program
    c. They consume processor time
    d. They are an incomplete solution.
40. The correct root to three decimal places of the equation **x3-3x-5=0** by using Newton-Raphson method is?
    a. 2.228
    b. 2.224
    c. 2.223
    d. 2.279
41. In which of the following methods proper choice of initial value is very important?
    a. Bisection method
    b. False position
    c. Newton-Raphson
    d. Bairsto method

42. The both sides of equation are multiplied by non-zero constant in?
    a. Gauss Elimination Method
    b. Gaussian Inconsistent procedure
    c. Gaussian consistent procedure
    d. Gaussian substitute procedure
43. In a relational data model, which one of the following statements is TRUE?
    a. A relation with only two attributes is always in BCNF.
    b. If all attributes of a relation are prime attributes, then the relation is in BCNF.
    c. Every relation has at least one non-prime attribute.
    d. BCNF decompositions preserve functional dependencies.
44. A prime attribute of a relation scheme R is an attribute that appears in?
    a. All candidate keys of R.
    b. Some candidate keys of R.
    c. In a foreign key of R.
    d. Only the primary key of R.
45. Given the basic ER and relational models, which of the following is INCORRECT?
    a. An attribute of an entity can have more than one value.
    b. An attribute of an entity can be composite.
    c. In a row of a relational table, an attribute can have more than one value.
    d. In a row of a relational table, an attribute can have exactly one value or a NULL value.
46. In software testing, how the error, fault and failure are related to each other?
    a. Error leads to failure but fault is not related to error and failure.
    b. Fault leads to failure but error is not related to fault and failure
    c. Error leads to fault and fault leads to failure.
    d. Fault leads to error and error leads to failure.
47. In which testing strategy requirements established during requirements analysis are validated against developed software?
    a. Validation Testing
    b. Integration Testing
    c. Regression Testing
    d. System Testing
48. In the context of modular software design, which one of the following combinations is desirable?
    a. High cohesion, high Coupling
    b. High Cohesion , Low Coupling
    c. Low Cohesion, Low Coupling
    d. Low Cohesion, high Coupling
49. HTTP runs at port
    a. 80
    b. 98
    c. 82
    d. 100
50. Repeaters operate at?
    a. Data Link Layer
    b. Physical Layer
    c. Application Layer
    d. None of the above

Part III (Advanced /Higher value questions

51. "If X, then Y unless Z" is represented by which of the following formulae in propositional logic? ("¬" is negation "^" is conjunction, and "→" is implication)
    a. $(X \wedge \neg Z) \rightarrow Y$
    b. $(X \wedge Y) \rightarrow \neg Z$
    c. $X \rightarrow (Y \wedge \neg Z)$
    d. $X \rightarrow (Y \wedge \neg Z)$
52. Consider the statement below:
    "There is a country that borders both India and Nepal."
    Which of the following represents the above sentence correctly?
    a. ∃c Border(Country(c), India ∧ Nepal)
    b. ∃c Country(c) ∧ Border(c, India) ∧ Border(c, Nepal)
    c. [∃c Country(c)] ⇒ [Border(c,India) ∧ Border(c, Nepal)]
    d. ∃c Country(c) ⇒ [Border(c, India) ∧ Border(c, Nepal)]
53. Chose the correct output of the following programming snippet:

```
void main()
{
  int a=15;
  printf("%d %d %d %d", ++a, a++,++a, a++);
  getch();
}
```

    a. 15 17 17 19
    b. 19 17 17 15
    c. 16 16 18 18
    d. 16 17 18 19
54. Consider the following program snippet

```
struct abc
{
        int data;
        struct abc *next;
        };
        void main()
        {
        typedef struct abc node;
        node s, *p;
        printf("The size of s = %d and p = %d",sizeof(s), sizeof(p));
        getch();
}
```

    What will be the output?

    a. The size of s = 2 and p = 2
    b. The size of s = 2 and p = 4
    c. The size of s = 4 and p = 4
    d. The size of s = 4 and p = 2
55. Consider the following operation performed on a stack of size 5 in the sequence from left to right:
    Push (1); Push (2); Pop (); Push (3); Pop (); Push (4); Pop (); Push (5); Pop ();
    After the completion of all operations, the number at top of the stack will be:
    a. 1
    b. 2
    c. 3
    d. 4

56. A hash function h defined h(key)=key mod 7, with linear probing, is used to insert the keys 44, 45, 79, 55, 91, 18, 63 into a table indexed from 0 to 6. What will be the location of key 63?
    a. 1
    b. 2
    c. 3
    d. 4
57. A binary search tree is constructed by inserting the following numbers in order:
    60, 25, 72, 15, 30, 68, 101, 13, 18, 47, 70, 34
    The number of nodes in the left sub-tree is?
    a. 5
    b. 6
    c. 7
    d. 3
58. How many rotations are required during the construction of an AVL tree if the following elements are to be added in the given sequence?
    35, 50, 40, 25, 30, 60, 78, 20, 28
    a. 2 left rotation, 2 right rotation
    b. 2 left rotation, 3 right rotation
    c. 3 left rotation, 2 right rotation
    d. 3 left rotation, 1 right rotation
59. Suppose that a connected planar graph has six vertices, each of degrees four. Into how many regions is the plane divided by a planar representation of this graph?
    a. 6
    b. 8
    c. 12
    d. 10
60. Consider the poset ({3,5, 9,15, 24, 45},|).
    Which of the following is correct for the given poset?
    a. There exists a greatest element and a least element
    b. There exists a greatest element but not a least element
    c. There exists a least element but not a greatest element
    d. There does not exist a greatest element and a least element
61. When a method in a subclass has the same name and type signatures as a method in the super class, then the method in the subclass..... the method in the super class.
    a. Friendships
    b. Inherits
    c. Overloads
    d. Overrides
62. Which of the following functions will copy the null-terminated string **src** into **dst**?
    a. dest = src;
    b. strcpy(src,dst);
    c. dest == src;
    d. strcpy(dst,src);
63. Which of the following is false in the case of a spanning tree of a graph G?
    a. It is tree that spans G
    b. It is a subgraph of the G
    c. It includes every vertex of the G
    d. It can be either cyclic or acyclic
64. Let P is a quick sort program to sort numbers in ascending order using the first element as the pivot. Let t1 and t2 be the number of comparisons made by P for the inputs [1 2 3 4 5] and [4 1 5 3 2] respectively. Which one of the following holds?
    a. t1 = 5
    b. t1 < t2
    c. t1 > t2
    d. t1 = t2

65. Match the following:

List - I

(P) Prim's algorithm for minimum spanning tree
(Q) Floyd-Warshall algorithm for all pairs shortest paths
(R) Mergesort
(S) Hamiltonian circuit

List - II

(i) Backtracking
(ii) Greedy method
(iii) Dynamic programming
(iv) Divide and conquer

a. P-iii, Q-ii, R-iv, S-i
b. P-i, Q-ii, R-iv, S-iii
c. P-ii, Q-iii, R-iv, S-i
d. P-ii, Q-i, R-iii, S-iv

66. Consider the following C program

```
int main()
{
  int x, y, m, n;
  scanf ("%d %d", &x, &y);
  /* x > 0 and y > 0 */
  m = x; n = y;
  while (m != n)
  {
    if(m>n)
      m = m - n;
    else
      n = n - m;
  }
  printf("%d", n);
}
```

What does the program compute?

a. x + y using repeated subtraction
b. x mod y using repeated subtraction
c. the greatest common divisor of x and y
d. the least common multiple of x and y

67. Krushkal's algorithm to find Minimum Spanning Tree is more suitable for?

a. Sparse Matrix
b. Dense Graph
c. Sparse Graph
d. None of these

68. The profits and weights are positive in?

a. MaxMin
b. Knapsack
c. Greedy
d. Dynamic

69. We use dynamic programming approach when?

a. We need an optimal solution
b. The solution has optimal substructure
c. The given problem can be reduced to the 3-SAT problem
d. It's faster than greedy

70. The solution of the recurrence relation T(m)=T(3m/4)+1 is :

a. $\theta(\lg m)$
b. $\theta(m)$
c. $\theta(m \lg m)$
d. $\theta(\lg \lg m)$

71. If there are n integers to sort, each integer has d digits, and each digit is in the set {1, 2, ...,k}, radix sort can sort the numbers in:
    a. O (k (n + d))
    b. O(d (n + k))
    c. O((n + k) lg d)
    d. O((n + d) lg k)
72. A memory management system has 64 pages with 512 bytes page size. Physical memory consists of 32 page frames. Number of bits required in logical and physical address are respectively:
    a. 14 and 15
    b. 14 and 29
    c. 15 and 14
    d. 16 and 32
73. Which of the following addressing mode is best suited to access elements of an array of contiguous memory locations?
    a. Indexed addressing mode
    b. Base Register addressing mode
    c. Relative address mode
    d. Displacement mode
74. Arrange the following types of machine in descending order of complexity.
    (A) SISD
    (B) MIMD
    (C) SIMD
    Choose the correct answer from the options given below:
    a. A, B, C
    b. C, B, A
    c. B, C, A
    d. C, A, B
75. A processor has 40 distinct instructions and 24 general purpose registers. A 32-bit instruction word has an opcode, two register operands and an immediate operand. The number of bits available for the immediate operand field is _____.
    a. 11
    b. 12
    c. 14
    d. 16
76. Which of the following is correct?
    a. Page fault occurs when a program accesses a page of another program
    b. Page fault occurs when a program accesses a page in main memory
    c. Page fault occurs when there is an error in particular page
    d. Page fault occurs when a program accesses a page which is not present in main memory
77. In CISC architecture most of the complex instructions are stored in
    a. CMOS
    b. Register
    c. Transistors
    d. Diodes
78. Which phase of compiler generates stream of atoms?
    a. Syntax Analysis
    b. Lexical Analysis
    c. Code Generation
    d. Code Optimization
79. Which data structure is used by the compiler for managing variables and their attributes?
    a. Binary tree
    b. link list
    c. Symbol table
    d. Parse table

80. A compiler which allows only the modified section of the source code to be recompiled is called as
    a. Incremental compiler
    b. Selective compiler
    c. Reconfigured complier
    d. Dynamic complier
81. In a paging system, it takes 30 ns to search translation Look-aside Buffer (TLB) and 90 ns to access the main memory. If the TLB hit ratio is 70%, the effective memory access time is :
    a. 48ns
    b. 147ns
    c. 120ns
    d. 84ns
82. Suppose there are four processes in execution with 12 instances of a Resource R in a system. The maximum need of each process and current allocation are given below:

Process	Max. Need	Current Allocation
P1	8	3
P2	9	4
P3	5	2
P4	3	1

    With reference to current allocation, is system safe? If so, what is the safe sequence?
    a. No
    b. Yes, P 1 P 2 P 3 P 4
    c. Yes, P 4 P 3 P 1 P 2
    d. Yes, P 2 P 1 P 3 P 4
83. Consider a disk queue with I/O requests on the following cylinders in their arriving order:
    6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45
    The disk head is assumed to be at cylinder 23 and moving in the direction of decreasing number of cylinders. Total number of cylinders in the disk is 150. The disk head movement using SCAN-scheduling algorithm is:
    a. 151
    b. 173
    c. 227
    d. 228
84. Which of the following is incorrect for virtual memory?
    a. Large programs can be written
    b. More I/O is required
    c. More addressable memory available
    d. Faster and easy swapping of process
85. Random errors can be assessed?
    a. Empirically
    b. Statistically
    c. Experimentally
    d. By performing sensitivity analysis
86. By using Newton-raphson method, Double (Repeated) root of $4\times3 - 8\times2 - 3x + 9 = 0$ is?
    a. 1.6
    b. 1.55
    c. 1.4
    d. 1.5
87. Which of the methods is a direct method for solving simultaneous algebraic equations?
    a. Relaxation method
    b. Gauss seidel method
    c. Jacobi's method
    d. Cramer's rule

88. Given a Relational Schema R(A,B,C,D) with Functional dependencies F as (A->B,C->D) then what can be true about the relation
    a. R is in 2NF
    b. R is in 1NF.
    c. A is primary key of R.
    d. None of these
89. On deleting a parent node in Hierarchical data model.
    a. Child is linked to grandparent
    b. Child is attached to other node in the parent depth.
    c. Child node is deleted.
    d. None of these
90. In a distributed database system, the deadlock prevention method by aborting the transaction can be used such as
    a. Time stamping
    b. Wait-die method
    c. Wound-wait method
    d. All of the above.
91. A company needs to develop a strategy for software product development for which it has a choice of two programming languages L1 and L2. The number of lines of code (LOC) developed using L2 is estimated to be twice the LOC developed with Ll. The product will have to be maintained for five years. Various parameters for the company are given in the table below.

Parameter	Language L1	Language L2
Man years needed for development	LOC/10000	LOC/10000
Development cost per man year	Rs. 10,00,000	Rs. 7,50,000
Maintenance time	5 years	5 years
Cost of maintenance per year	Rs. 1,00,000	Rs. 50,000

Total cost of the project includes cost of development and maintenance. What is the LOC for L1 for which the cost of the project using L1 is equal to the cost of the project using L2?
    a. 4500
    b. 5000
    c. 4001
    d. 4990
92. In function point analysis, the number of complexity adjustment factors is
    a. 10
    b. 12
    c. 14
    d. 20
93. Which of the following are applied throughout the software process?
    a. Framework activities
    b. Umbrella activities
    c. Planning activities
    d. Construction activities
94. Stages of CMMI in order of decreasing maturity with I-Initial, D-Defined, R- Repeatable, M-Managed, O-Optimized as stages are
    a. I,D,R,M,O
    b. I,R,D,M,O
    c. I, D, M, R, O
    d. I, R, M , D, O
95. Which one of the following set of attributes should not be encompassed by effective software metrics?
    a. Simple and computable
    b. Consistent and objective
    c. Consistent in the use of units and dimensions
    d. Programming language dependent

96. Determine the maximum length of the cable (in km) for transmitting data at a rate of 500 Mbps in an Ethernet LAN with frames of size 10,000 bits. Assume the signal speed in the cable to be 2, 00,000 km/s.
    a. 1
    b. 2.5
    c. 3
    d. 2
97. The message 11001001 is to be transmitted using the CRC polynomial x^3 + 1 to protect it from errors. The message that should be transmitted is:
    a. 11001001000
    b. 11001001011
    c. 11001010
    d. 110010010011
98. In an IPv4 datagram, the M bit is 0, the value of HLEN is 10. The position of the datagram is
    a. Last Fragment
    b. First Fragment
    c. cannot be decided from the information
    d. None of the above
99. Time to Live (TTL) field in IP datagram is best explained as?
    a. It can be used to prioritize packets
    b. It can be used to decide about being position of the packet
    c. It can be used to optimize throughput
    d. It can be used to prevent packet looping
100. Poison reverse in Distance vector routing is associated with
    a. Flooding of packets
    b. Sharing packets with immediate neighbours
    c. Use of timers during packet sharing
    d. None of the above.