



Booklet No. :

CS - 15

Computer Science & Information Technology

Duration of Test : 2 Hours

Max. Marks : 120

Hall Ticket No.

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Name of the Candidate : _____

Date of Examination : _____ OMR Answer Sheet No. : _____

Signature of the Candidate

Signature of the Invigilator

INSTRUCTIONS

1. This Question Booklet consists of **120** multiple choice objective type questions to be answered in **120** minutes.
2. Every question in this booklet has 4 choices marked (A), (B), (C) and (D) for its answer.
3. Each question carries **one** mark. There are no negative marks for wrong answers.
4. This Booklet consists of **16** pages. Any discrepancy or any defect is found, the same may be informed to the Invigilator for replacement of Booklet.
5. Answer all the questions on the OMR Answer Sheet using **Blue/Black ball point pen only**.
6. Before answering the questions on the OMR Answer Sheet, please read the instructions printed on the OMR sheet carefully.
7. OMR Answer Sheet should be handed over to the Invigilator before leaving the Examination Hall.
8. Calculators, Pagers, Mobile Phones, etc., are not allowed into the Examination Hall.
9. No part of the Booklet should be detached under any circumstances.
10. The seal of the Booklet should be opened only after signal/bell is given.

CS-15-A



COMPUTER SCIENCE & INFORMATION TECHNOLOGY (CS)

1. The variance of a random variable having exponential distribution with parameter λ is
 (A) λ^2 (B) λ (C) $\sqrt{\lambda}$ (D) none

2. The value of the constant k so that the function

$$f(x) = \begin{cases} kx(1-x), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

is a proper density function, is

- (A) 6 (B) 3 (C) 1/2 (D) 1/6

3. A signal received at a detector may be Gaussian $N(200, 100)$ at time t. The probability that the signal is larger than 230 micro volts, given that it is larger than 210 micro volts is

(A) $\frac{\int_{230}^{\infty} e^{-\frac{1}{2}z^2} dz}{\int_{210}^{\infty} e^{-\frac{1}{2}z^2} dz}$ (B) $\int_{210}^{\infty} e^{-\frac{1}{2}z^2} dz$ (C) $\frac{\int_{230}^{\infty} e^{-\frac{1}{2}z^2} dz}{\int_1^{\infty} e^{-\frac{1}{2}z^2} dz}$ (D) None

4. If a homogeneous system of n equations in n unknowns $AX = 0$ has nontrivial solution if
 (A) $|A| = 0$ (B) $|A| = n$ (C) $|A| = 1$ (D) $|A| \neq 0$

5. If the eigen values of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ are 0, 3 and 15, then the eigen

values of the matrix $B = 2A + I$ are

- (A) 8, 7, 3 (B) 1, 7, 31 (C) 0, 3, 15 (D) do not exist

6. The condition for convergence of Newton Raphson iteration scheme $x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$ at $x = x_0$ is

- (A) $f''(x_0)f(x_0) \leq 0$ (B) $[f'(x_0)]^2 \leq 1$
 (C) $f''(x_0)f(x_0) \leq [f'(x_0)]^2$ (D) Always converges

7. By secant method the next approximation root for the function $f(x) = x^2 - x - 2$ in the interval (1, 2) is

- (A) $x_1 = 1$ (B) $x_1 = 2$ (C) $x_1 = 0$ (D) $x_1 = 3/2$

8. If $f(x)$ is given in the following table then the value of $\int_0^4 f(x)dx$ by Simpson 1/3 rule is

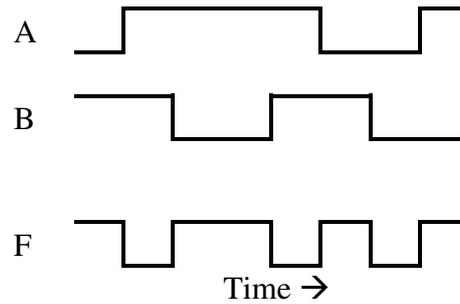
x	0	1	2	3	4
f(x)	1	1	3	7	13

- (A) 26 (B) 15 (C) 18 (D) 17.33

9. If $f(x) = (x - 1)(x - 2)$ is defined in the interval $[1, 3]$ the value of c at which the Lagrange Mean Value is satisfied at
 (A) $c = 0$ (B) $c = 3 / 2$ (C) $c = 1$ (D) $c = 2$
10. If $x = v + w, y = w + u, z = u + v$ the value of $\frac{\partial(x, y, z)}{\partial(u, v, w)}$ is
 (A) 0 (B) 3 (C) 1 (D) 2
11. The total number of possible records in a database table, if it contains two fields, a 5-letter name, and a 2-digit age, is
 (A) 1188137600 (B) $390625^2 \times 10^{10}$
 (C) 11881476 (D) 2600
12. Number of ways a row of n houses can be painted with k colours such that no two consecutive houses can have same colours
 (A) $n.(n-1).(n-2) \dots (n+k-1)$ (B) $n.(n-1).(n-2) \dots (n-k+1)$
 (C) $(n-1)^{k-1}$ (D) $k.(k-1)^{n-1}$
13. An urn contains 40 balls, namely 10 each of the colours Cyan, Magenta, Yellow and Black. If 3 balls are picked up (repeat colours allowed) from the urn, how many different colour combinations we can get ?
 (A) ${}^{40}C_3$ (B) $6! / (2.3!)$ (C) ${}^{10}C_3$ (D) 6C_3
14. Find the coefficient of a^{15} in the expansion of $(1 + a^7 + a^8)^{10}$
 (A) 90 (B) 560 (C) 1 (D) 0
15. The recurrence relation corresponding to the sequence '5, 9, 17, 33 ...' is
 (A) $a_n = a_{n-1} + 4$ (B) $a_n = 3a_{n-1} - 6$
 (C) $a_n = -a_{n-1} + 14$ (D) $a_n = 2a_{n-1} - 1$
16. The graph G is said to be k -edge-connected, if its edge-connectivity $\lambda(G)$ is
 (A) equal to k (B) not equal to k
 (C) greater than or equal to k (D) less than or equal to k
17. The maximum number of edges in an undirected simple graph with N vertices is
 (A) N^2 (B) $N!$ (C) N_{P_2} (D) $N(N-1)/2$
18. A planar graph has the following property :
 (A) It can be drawn such that edges do not cross
 (B) There are more edges than the number of vertices
 (C) Every vertex is connected by at least one edge
 (D) It can not be drawn on a non planar surface

19. The following algorithm is not for finding MST
 (A) Dijkstra's (B) Borůvka's algorithm
 (C) Prim's (D) Kruskal's
20. If a graph A can be redrawn such that it looks exactly like graph B, then
 (A) A is dual of B (B) A and B are isomorphic
 (C) A and B are isographs (D) A is a line graph of B
21. Minimum vertex cover problem seeks to find
 (A) the minimum set of vertices such that each edge of the graph is incident to at least one vertex of the set
 (B) the minimum set of vertices such each can be given a unique colour
 (C) the minimum set of edges that join each vertex of the graph
 (D) the minimum set of vertices such that each face of graph is touched by at least one vertex of the set
22. A graph that contains no loops is called
 (A) a connected graph (B) an acyclic graph
 (C) a simple graph (D) a bipartite graph
23. Warshall's algorithm is used to compute the following of a graph:
 (A) Induced subgraph (B) Adjacency matrix
 (C) Chromatic number (D) Reachability matrix
24. Which of the following sentences is not a proposition ?
 (A) The sky is blue (B) $5 + 7 = 10$
 (C) $a = 100$ (D) 3 is a root of $x^2 - 9$
25. The meaning of the logical expression
 $\exists a \exists b (\text{Has}(\text{Radha}, a) \wedge \text{Book}(a) \wedge \text{Has}(\text{Radha}, b) \wedge \text{Book}(b) \wedge \neg (a = b))$ is
 (A) Radha has two books named a and b
 (B) Radha has two books
 (C) Radha has one book
 (D) Radha does not have any books
26. Consider the definition: "A prime number is an integer greater than 1 and not divisible by any number other than itself and 1". The equivalent logical expression is
 (A) $\forall N ((N > 1) \wedge \neg \exists m ((m > 1) \wedge (m < N) \wedge (\text{mod}(N, m) = 0))) \rightarrow \text{prime}(N)$
 (B) $\exists N ((N > 1) \wedge \neg \forall m ((m > 1) \wedge (m < N) \wedge (\text{mod}(N, m) = 1))) \rightarrow \text{prime}(N)$
 (C) $\neg \forall N ((N > 1) \wedge \exists m ((m > 1) \wedge (m < N) \wedge (\text{mod}(N, m) = 0))) \rightarrow \text{prime}(N)$
 (D) $\forall N ((N > 1) \wedge \neg \forall m ((m > 1) \wedge (m < N) \wedge (\text{mod}(N, m) = 0))) \rightarrow \text{prime}(N)$
27. $(A \rightarrow B) \vee (B \rightarrow A)$ is equivalent to
 (A) $A \leftrightarrow B$ (B) a contradiction
 (C) a tautology (D) $(\sim A \wedge \sim B) \vee (A \wedge B)$

28.



Identify the logical function that gives rise to the above timing diagram.

- (A) $F = A' B$ (B) $F = A' B + A B'$
 (C) $F = A + B'$ (D) $F = A' B'$

29.

		1	1
		1	

The Boolean expression corresponding to the above K-map is

- (A) $XY + Y'Z$ (B) $YZ + X'Y$
 (C) $ZX + X'Y$ (D) $XY + X'Y'$

30. The smallest multiplexer required to emulate all 2-input gates

- (A) 16-to-1 multiplexer (B) 8-to-1 multiplexer
 (C) 4-to-1 multiplexer (D) 2-to-1 multiplexer

31. In positive edge triggering,

- (A) the input changes on the positive edge of the clock
 (B) the output changes on the positive edge of the clock
 (C) the output changes when the input and the clock are high
 (D) the output changes on the raising edge of the input

32. For the data type 'double', the size of 'mantissa' is

- (A) 53 bits (B) 52 bits (C) 47 bits (D) 48 bits

33. What is the minimum number of states possible in a sequential circuit with four flip-flops ?

- (A) 1 (B) 16 (C) 2 (D) 15

34. In 'excess 127' notation, - 56 is represented as

- (A) 173 (B) 71 (C) -184 (D) 72

35. A 32-bit processor

- (A) has only 32-bit machine instructions
 (B) has 32-bit address space
 (C) can directly perform operations on 32 bit data
 (D) must have 32-bit data bus

36. The instruction 'POP BX' is an example of
 (A) immediate addressing mode (B) direct addressing mode
 (C) implicit addressing mode (D) relative addressing mode
37. In DMA mode, the I/O device controls the following buses:
 (A) Data bus only (B) Address bus only
 (C) Data and address busses only (D) Data, address, and control busses
38. Pen drive is an example of
 (A) volatile memory (B) solid state memory
 (C) ROM (D) magnetic memory
39. I/O channel controller is
 (A) a piece of software
 (B) a combinational circuit
 (C) a device to eliminate noise in I/O communication
 (D) a special processor
40. RISC instruction sets have smallest number of the following type of instructions :
 (A) register to register (B) machine control
 (C) arithmetic (D) memory to register
41. A computer system has a direct-mapped cache of 32 kB in size, with 64-byte cache blocks. What is the tag size assuming main memory size of 1 MB ?
 (A) 6 bits (B) 9 bits (C) 5 bits (D) 14 bits
42. In a computer system the access time of main memory is 100 ns, and the access time of cache is 5 ns. If the hit rate is 96%, what is the average access time ?
 (A) 8.8 ns (B) 8.6 ns (C) 52.5 ns (D) 9.0 ns
43. Implementation technology of the main memory used in general purpose computers is
 (A) static RAM (B) dynamic RAM
 (C) register memory (D) virtual memory
44. The major component of the access time of secondary storage is
 (A) seek time (B) rotational latency
 (C) transfer time (D) idle time

51. What is the content of array g, after executing the following code ?

```
int g[9] = {34, 0, 78, 2, 5, 90, 23, 1, 7}; int size = 9, t ;
for(int k=size/2; k >1 ; k--) {
t = g[k] ; g[k] = g[size-k] ; g[size-k] = t ;
}
```

(A) {7, 1, 23, 90, 5, 2, 78, 0, 34} (B) {1, 23, 90, 5, 2, 78, 0, 34, 7}
(C) {34, 1, 23, 90, 5, 2, 78, 0, 7} (D) {34, 0, 1, 23, 90, 5, 2, 78, 7}
52. The steps involved in inserting a node pointed to by p1, after a node pointed to by p2 in a linked list
(A) ptr = p1 → link; p1 → link = p2 → link; p2=ptr;
(B) ptr=p2 → link; p2 → link=p1 → link; p1 → link=ptr;
(C) p1 → link=p2 → link; p2 → link=p1;
(D) p2 → link=p1 → link; p1 → link=p2;
53. For implementing priority queues, the following data structure gives better performance
(A) Array (B) Linked list
(C) Heap (D) Binary tree
54. Approximately balanced m-ary tree is called
(A) B-tree (B) minimum spanning tree
(C) AVL tree (D) red-black tree
55. In AVL tree, the height of right sub tree minus the height of left sub tree for every node is
(A) greater than 1 (B) zero
(C) between -1 and 1 (D) less than one
56. A binary heap satisfies the following property :
(A) Every node has either two or zero children
(B) All nodes store either 0 or 1
(C) It is a perfect binary tree
(D) The value in every node must always be less than the values in its children
57. Algorithm analysis
(A) generates the source code from flowchart
(B) estimates the resources needed by an algorithm
(C) gives a procedure for developing efficient algorithms
(D) gives the result of executing the algorithm
58. Best case complexity of selection sort
(A) O(N) (B) O(N²) (C) O(log₂N) (D) O(log₁₀N)
59. The number of leaf nodes in a perfect binary tree with N nodes
(A) log₂[(N/2)] (B) 2^(N+1) - 2^(N-1)
(C) log₂(N+1) (D) (N+1)/2

60. What is the order of complexity if a problem of size N takes an execution time of $1.5N^3 - 50N^2 + 1.1^N - \log_{10}N$?
 (A) $O(N^3)$ (B) $O(1.1^N)$ (C) $O(N^2)$ (D) $O(\log_{10}N)$
61. Which is the best sort algorithm to use, if our list is already sorted except for the last two elements ?
 (A) Bubble sort (B) Heap sort (C) Insertion sort (D) Quick sort
62. $f(n) = \Omega(g(n))$ implies
 (A) $\exists k > 0 \exists n_0 \forall n > n_0 f(n) \leq k.g(n)$
 (B) $\forall k > 0 \exists n_0 \forall n > n_0 |f(n)| \leq k.|g(n)|$
 (C) $\forall k > 0 \exists n_0 \forall n > n_0 |f(n)| \geq k.|g(n)|$
 (D) $\exists k > 0 \exists n_0 \forall n > n_0 f(n) \geq k.g(n)$
63. Consider the problem of choosing the smallest number of coins that add up to 40 using coin denominations 1, 5, 10, 20, 25. The denomination of the first coin chosen by a Greedy algorithm
 (A) 1 (B) 10 (C) 20 (D) 25
64. What is the order of complexity of searching for an item among N items stored in a Hash table of size M , assuming $M \gg N$?
 (A) $O(M+N)$ (B) $O(M)$ (C) $O(N)$ (D) $O(1)$
65. The following data structure is most suitable to implement depth-first traversal of a graph without recursion
 (A) Stack (B) Array (C) Queue (D) Linked list
66. In dynamic programming,
 (A) the problem cannot be divided into sub problems
 (B) sub problems are allowed to overlap
 (C) recursion must be used
 (D) our solutions normally have $O(a^N)$ complexity
67. An NP-complete problem is
 (A) always polynomial time (B) never polynomial time
 (C) NP and NP-hard (D) NP but not NP-hard
68. The regular expression $a(b|e)c^+$ denotes
 (A) { a ab abc ac abcc abccc ... }
 (B) { a b ab abc abcc abccc ... }
 (C) { ac abc acc abcc abccc ... }
 (D) { abc ac abcabc acac acacac ... }

69. The languages accepted by FSMs are
(A) regular languages (B) context-free languages
(C) context-sensitive languages (D) natural languages
70. Given a computer program and an input, deciding whether the program finishes or runs for ever is called
(A) Godel's problem (B) Turing problem
(C) Neumann problem (D) Halting problem
71. Turing recognizable languages are not closed under
(A) complement (B) union
(C) kleene star (D) intersection
72. While performing a transition, a pushdown automaton can not
(A) push a symbol on to the stack
(B) pop a symbol out of the stack
(C) traverse the stack
(D) leave stack without any change
73. Backus-Naur form provides the following of a language
(A) grammatical structure (B) lexical structure
(C) semantics (D) abstract data structure
74. The following software generates ready-to-execute code
(A) Assembler (B) Loader
(C) Linker (D) Compiler
75. Garbage collection is related to
(A) e-waste management
(B) automatic memory management
(C) collection of source code lines containing errors
(D) automatic code management
76. Proper sequence in the phases of a compiler
(A) Type checking, Lexical analysis, Syntax analysis, Register allocation
(B) Lexical analysis, Type checking, Syntax analysis, Register allocation
(C) Register allocation, Type checking, Lexical analysis, Syntax analysis
(D) Lexical analysis, Syntax analysis, Type checking, Register allocation
77. Constant folding involves
(A) evaluation at link time
(B) evaluation at compile time
(C) replacing similar constants by one
(D) computing a constant at execution time

78. PCB does not contain the following information :
- (A) Memory used by the process
 - (B) Information about open files
 - (C) Processor state data
 - (D) List of processes waiting in the ready queue
79. A TLB stores
- (A) page table entries
 - (B) PCBs
 - (C) frequently executed instructions
 - (D) subroutine return addresses
80. The following is not a synchronization object :
- (A) fork
 - (B) Mutex
 - (C) Semaphore
 - (D) Monitor
81. The Banker's algorithm is used for
- (A) deadlock prevention
 - (B) detecting a deadlock
 - (C) measuring deadlocked time
 - (D) deadlock avoidance
82. Thrashing can be prevented by
- (A) increasing the clock speed
 - (B) reducing degree of multi programming
 - (C) increasing disk storage
 - (D) reducing the number of pages allocated
83. A hypervisor is
- (A) an operating system
 - (B) a virtual machine monitor
 - (C) a virtual operating system
 - (D) a super computer
84. Most of the modern operating systems do not support
- (A) preemption
 - (B) micro kernel
 - (C) multithreading
 - (D) virtualization
85. 'The principle of least privilege' is a strategy used for
- (A) protection
 - (B) reducing turn around time
 - (C) deadlock prevention
 - (D) controlling thrashing
86. The following is not a threat to operating system security
- (A) Login spoofing
 - (B) Denial of service
 - (C) Deadlock
 - (D) Buffer overflow
87. In an E-R model, an attribute is
- (A) attached to only entities
 - (B) never attached to relationships
 - (C) attached to either entities or relationships
 - (D) a parameter with an independent existence

95. Consider a database with the tables

person(ID, name, account)
company(ID, name)
employed(pID, cID)

Identify the correct SQL statement that gives a bonus of Rs 10000 to all 'INTEL' employees

- (A) SELECT person UPDATE account = account + 10000
WHERE (person.ID = company.ID) and (company.name = 'INTEL')
- (B) SELECT person UPDATE account SET to account + 10000
WHERE (person.ID = company.ID) and (company.name = 'INTEL')
- (C) UPDATE person SET account = account + 10000
WHERE (person.ID = employed.pID) and (company.name = 'INTEL')
and (company.ID = employed.cID)
- (D) UPDATE person.account SET account = account + 10000
WHERE (person.ID = employed.pID) and (company.ID = employed.cID)
and (company.name = 'INTEL')

96. You have ordered some groceries in the local super market and paid through your card. The items are expected to be home delivered the next day, but it never happens. What property of the transaction is violated ?

- (A) Durability
- (B) Consistency
- (C) Isolation
- (D) Atomicity

97. The following is not a method of information gathering:

- (A) asking
- (B) training
- (C) brain storming
- (D) prototyping

98. The potential of a project for success is studied in

- (A) Feasibility analysis
- (B) Requirements analysis
- (C) Testing
- (D) Process specification

99. A data flow diagram outlines

- (A) various steps involved in program execution
- (B) the output of a program
- (C) the flow of control through the data structures
- (D) transformation and transmission of data within the multiple stages of a system

100. Large teams are preferable compared to small teams if

- (A) cohesion is important
- (B) effective communication is to be achieved
- (C) the work involves diverse skills sets
- (D) quick decision making is important

- 101.** In basis path testing, the number of test cases is equal to
 (A) the cyclomatic complexity of the program
 (B) the number of function points of the program
 (C) the number of loops in the program
 (D) the number of subroutines in the program
- 102.** Adaptive maintenance is performed
 (A) to correct the bugs discovered by the user
 (B) to continuously modify the software to make it usable in a changing environment
 (C) to modify software to detect and remove potential bugs
 (D) to modify software to improve its performance
- 103.** Software reliability is measured in terms of
 (A) Mean Time To Failure (B) Mean Time Between Failures
 (C) Mean Time To Repair (D) Mean Time Between Upgrades
- 104.** The design phase is not concerned with
 (A) algorithms (B) software architecture
 (C) data structure (D) specifications
- 105.** Iterative risk analysis is implemented in
 (A) Spiral model (B) Prototyping model
 (C) Water fall model (D) V model
- 106.** Number of layers in TCP/IP model
 (A) 4 (B) 7 (C) 3 (D) 6
- 107.** Layer-3 switching makes use of
 (A) MAC addresses (B) IP addresses
 (C) Network port addresses (D) Host names
- 108.** Size of an IP packet
 (A) 1024 bits (B) 65536 bytes (C) 65535 bytes (D) 65535 bits
- 109.** A network socket is defined by
 (A) Host name and IP address (B) Port address only
 (C) MAC address and IP address (D) IP address and port address
- 110.** A gateway must have a minimum of
 (A) 1 network address (B) 3 network addresses
 (C) 2 network addresses (D) 1 network address and a port number
- 111.** Identify the correct statement
 (A) Selective Repeat ARQ is the most efficient protocol
 (B) Go Back N ARQ is better than Selective Repeat ARQ
 (C) Stop-and-Wait ARQ is the most efficient protocol
 (D) Stop-and-Wait ARQ is better than Go Back N ARQ but worse than Selective Repeat ARQ

112. Public key cryptography uses public keys of size above
(A) 80 bits (B) 128 bits (C) 512 bits (D) 256 bits
113. Dynamic Host Control Protocol Server is used
(A) in efficient transmission of IP packets
(B) to find IP address, given the domain name
(C) to distribute IP addresses
(D) for congestion control
114. A firewall is used to protect
(A) any networked device (B) web servers
(C) gateways (D) networked computers only
115. A digital signature is used to authenticate
(A) the identity of the sender and the integrity of the message
(B) the identity of the sender only
(C) the integrity of the message only
(D) the identity of the receiver and the integrity of the message
116. A hop counter is included with in the packet to
(A) increase its life time
(B) enable it to travel through the shortest path
(C) detect duplicate packets
(D) to limit its life time
117. WWW is nothing but
(A) internet (B) a collection of web servers
(C) an information system (D) a computer network
118. An XML document
(A) is a structured document (B) is not human readable
(C) can not use HTML tags (D) is not machine readable
119. Server virtualization means
(A) providing a server with a huge amount of virtual memory
(B) a single virtual server hosting multiple physical server machines
(C) providing fake servers
(D) a single hardware platform hosting multiple servers
120. HTML is
(A) a scripting language (B) a mark-up language
(C) a programming language (D) a markup as well as a scripting language

SPACE FOR ROUGH WORK