(59)

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

T. B. C. : PGT – 6/21

Test Booklet Series

A

TEST BOOKLET

PAPER – II

60089

COMPUTER SCIENCE

Sl. No.

Time Allowed : 2 Hours

Maximum Marks : 100

SEAL

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET OF THE SAME SERIES ISSUED TO YOU.

2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D**, AS THE CASE MAY BE, IN THE APPROPRIATE PLACE IN THE ANSWER SHEET USING BALL POINT PEN (BLUE OR BLACK).

3. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else.*on the Test Booklet.

4. **YOU ARE REQUIRED TO FILL UP & DARKEN ROLL NO., TEST BOOKLET / QUESTION BOOKLET SERIES IN THE ANSWER SHEET AS WELL AS FILL UP TEST BOOKLET / QUESTION BOOKLET SERIES AND SERIAL NO. AND ANSWER SHEET SERIAL NO. IN THE ATTENDANCE SHEET CAREFULLY. WRONGLY FILLED UP ANSWER SHEETS ARE LIABLE FOR REJECTION AT THE RISK OF THE CANDIDATE.**

5. This Test Booklet contains **100** items (questions). Each item (question) comprises four responses (answers). You have to select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), you should mark (darken) the response (answer) which you consider the best. In any case, choose **ONLY ONE** response (answer) for each item (question).

6. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided, by **using BALL POINT PEN (BLUE OR BLACK)**. See instructions in the Answer Sheet.

7. All items (questions) carry equal marks. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. **There will be no negative markings for wrong answers**.

8. Before you proceed to mark (darken) in the Answer Sheet the responses (answers) to various items (questions) in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions sent to you with your **Admission Certificate**.

9. After you have completed filling in all your responses (answers) on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the *Answer Sheet* issued to you. You are allowed to take with you the candidate's copy / second page of the Answer Sheet along with the **Test Booklet**, after completion of the examination, for your reference.

10. Sheets for rough work are appended in the Test Booklet at the end.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

MJ – 6A/8

(Turn over)

1. The number of nodes in the input layer is 10 and the hidden layer is 5. The maximum number of connections from the input layer to the hidden layer are :

   (A) 50

   (B) Less than 50

   (C) More than 50

   (D) It is an arbitrary value

2. What is the most important challenge for smart healthcare ?

   (A) Data Privacy

   (B) Data Security

   (C) Connectivity

   (D) Energy Dissipation

3. Data Analysis is a process of :

   (A) Inspecting data

   (B) Cleaning data

   (C) Transforming data

   (D) All of these

4. How to carry out an array function together with one or more images ?

   (A) Pixel by Pixel

   (B) Column by column

   (C) Array by Array

   (D) Row by Row

5. Which of the following is one of the key data science skills ?

   (A) Statistics

   (B) Machine Learning

   (C) Data Visualization

   (D) All of these

6. In Visual Analytics, focus is more on :

   (A) Rendering

   (B) Interaction

   (C) Data storage

   (D) None of these

7. A solution of the problem for representing parallelism in an algorithm is :

   (A) CDA

   (B) TPA

   (C) CUDA

   (D) CUD

8. If n = 1, then f(n) = 1 ; Else if n > 1, then f(n) = f(n – 1) + 1/n. Such function can be best described by :

   (A) $f(n) = O(n!)$

   (B) $f(n) = O(\log n)$

   (C) $f(n) = O(\log(\log n))$

   (D) $f(n) = O(n\log n)$

   Hints : For the formal definition, suppose $f(x)$ and $g(x)$ are two functions defined on some subset of the real numbers.

   We write

   $f(x) = O(g(x))$

   iff there exist constants N and C such that

   $|f(x)| \Leftarrow C\,|g(x)|$ for all $x > N$

9. Connectionless communication is not more reliable over connection-oriented communication.

    (A) True

    (B) False

    (C) May be

    (D) Can't say

10. Queue follows first in first out policy and Stack follows last in first out policy. Then, how many queues are required to implement a stack ?

    (A) 2

    (B) 3

    (C) 4

    (D) Not possible

11. User-defined data type is :

    (A) Array

    (B) Enum

    (C) Union

    (D) Pointer

12. Pigeonhole principle states that if $f : A \to B$ and $|A| > |B|$, then :

    (A) f is not onto

    (B) f is not $1 - 1$

    (C) f is neither $1 - 1$ nor onto

    (D) f may be $1 - 1$

13. A complete binary tree with the property that the value at each node is at least as large as the values at its children is known as :

    (A) Binary search tree

    (B) AVL tree

    (C) Completely balanced tree

    (D) Heap

14. The grammars $G = < \{s\}, \{0, 1\}, P, S >$ where $P = \{S \to 0S1, S \to OS, S \to S1, S \to 0\}$ is a :

    (A) Recursively enumerable language

    (B) Regular language

    (C) Context-free language

    (D) Context-sensitive language

15. Which is not a decision making and branching statement ?

    (A) switch statement

    (B) goto statement

    (C) do-while statement

    (D) if statement

16. Which normal form is considered adequate for normal relational database design ?

    (A) 2 NF

    (B) 5 NF

    (C) 4 NF

    (D) 3 NF

17. An algorithm is made up of 2 modules M1 and M2. If order of M1 is F(N) and M2 is G(N) then the order of the algorithm is :

    (A) MAX (F(N), G(N))

    (B) MIN (F(N), G(N))

    (C) F(N) + G(N)

    (D) F(N) * G(N)

18. Consider a grammar :

    G = < {s}, {0, 1}, P, S > where elements of P are

    S → SS, S → 0S1, S → 1S0,

    S → empty

    The grammar will generate

    (A) Recursively enumerable language

    (B) Regular language

    (C) Context-free language

    (D) Context-sensitive language

19. Select the data structure that mainly used during shift-reduce parsing :

    (A) Stack

    (B) Linked list

    (C) Queue

    (D) Array

20. State the logic family dissipates the least power :

    (A) RTL

    (B) NMOS

    (C) CMOS

    (D) ECL

21. The Boolean expression AB + AB' + A'C + AC is independent of the Boolean variable :

    (A) A

    (B) B

    (C) C

    (D) None of these

22. What is the minimum number of 2-input NAND gates required to perform the function of 2-input OR gate ?

    (A) 1

    (B) 2

    (C) 3

    (D) 5

23. Let N be the number of bits in the sum obtained by a ripple carry adder, then the time required by the adder is :

    (A) O(N)

    (B) O(Log n)

    (C) O(N LOG N)

    (D) Constant time

24. If each address space represents one byte of storage space, how many address lines are needed to access RAM chips arranged in a 4 X 6 array, where each chip is 8K X 4 bits :

(A) 13

(B) 16

(C) 15

(D) 17

25. What is the value of x provided $(12x)_3 = (123)_x$?

(A) 2

(B) 3

(C) 5

(D) None of these

26. Which of the following operation is performed more efficiently by doubly linked list than by linear linked list ?

(A) Deleting a node whose location is given

(B) Searching an unsorted list for a given item

(C) Inserting a node after the node with a given location

(D) Traversing the list to process each node

27. For C statements :

strcpy (city, "OPSC");

1 = strlen (city) ;

What is the value of 1 ?

(A) 4

(B) 5

(C) 6

(D) 7

28. A graph is a tree iff it :

(A) Is completely connected

(B) Is minimally connected

(C) Contains a circuit

(D) Is plannar

29. Number of elements in the array A[10] [8] [5] [2] is :

(A) 799

(B) 801

(C) 800

(D) None of these

30. Which is / are Storage Class (es) ?

(A) Auto

(B) Static

(C) Register

(D) All of these

31. C declaration : b = *p++ and b = *(p++) :

(A) Same

(B) Different

(C) Can't say

(D) None of these

32. If size is known, then use of which of the following data structure will be a better choice ?

(A) Array

(B) Linked list

(C) Both (A) and (B)

(D) Can't say

33. Associative memory is a :
   (A) Pointer addressable memory
   (B) Very cheap memory
   (C) Content addressable memory
   (D) Slow memory

34. What traversal techniques lists the nodes of a binary search tree in ascending order ?
   (A) Pre-order
   (B) In-order
   (C) Post-order
   (D) Top-down

35. Which of the following algorithm solves the all-pair shortest path problem :
   (A) Dijkstra
   (B) Floyd
   (C) Prim
   (D) Warshall

36. If a graph requires k different colors for its proper coloring, then the chromatic number of the graph is :
   (A) k/2
   (B) k – 1
   (C) k
   (D) 1

37. Which of the following tool is used to specify lexical analyzers for a variety of languages ?
   (A) LEX
   (B) YAAC
   (C) EQN
   (D) TEX

38. A hash function f defined as f(key) = key mod 7, with linear probing is used to insert the keys 37, 38, 72, 48, 98, 11, 56 into a table indexed from 0 to 6. The key 11 will be stored in the location :
   (A) 3
   (B) 4
   (C) 5
   (D) 6

39. Which of the following conversions is not possible ?
   (A) Regular grammar to context-free grammar
   (B) Non-deterministic fsa to deterministic fsa
   (C) Non-deterministic pda to deterministic pda
   (D) Non-deterministic tm to deterministic tm

40. The recurrence relation that arises in relation with the complexity of binary search is :
   (A) $T(n) = T(n/2) + k$, k is a constant
   (B) $T(n) = 2T(n/2) + k$, k is a constant
   (C) $T(n) = T(n/2) + \log n$
   (D) $T(n) = T(n/2) + n$

41. In compilers, the syntax analysis is done by :

(A) Lexical analyzer

(B) Scanner

(C) Parser

(D) Code generator

42. YACC generates parsers based on :

(A) LALR(1) grammars

(B) LL(1) grammars

(C) Operator-precedence grammars

(D) General context-free grammars

43. Object modules generated by assemblers that contain unresolved external references are resolved for two or more object modules by a / an :

(A) Linker

(B) Loader

(C) Operating System

(D) Compiler

44. With round-robin CPU scheduling in a time-shared system :

(A) Using very large time slices (quantas) degenerates into FCFS (First-Come First-Served) algorithm

(B) Using very small time slices (quantas) degenerates into LIFO (Last-In First-Out) algorithm

(C) Using extremely small time slice (quantas) improves performance

(D) Using medium sized time slice leads to SRTF (Shortest Remaining Time First) scheduling policy

45. Which of the following symbol table implementation has the minimum access time ?

(A) Hash Table

(B) Search Tree

(C) Linear List

(D) Self-organizing List

46. The parsing technique that avoids backtracking is :

(A) Top-Down

(B) Recursive-Descent

(C) Predictive

(D) Both (B) and (C)

47. A form of code that uses more than one process and processor, possibly of different type, and that may on occasions have more than one process or processor active at the same time, is known as :

(A) Multiprogramming

(B) Multithreading

(C) Broadcasting

(D) Time Sharing

48. Which of the following page replace-ment algorithms suffers from Belady's anamoly ?

(A) Optimal Replacement

(B) LRU

(C) FIFO

(D) Both (A) and (C)

49. The recurrence relation $T(n) = mT(n/2) + an^2$ is satisfied by :

(A) $T(n) = O(nm)$

(B) $T(n) = O(n \log m)$

(C) $T(n) = O(n^{\log m})$.

(D) $T(n) = O(m \log n)$

50. If A and B are square matrices of the same order such that AB = A and BA = B, then A and B are both :

(A) Singular

(B) Idempotent

(C) Non-singular

(D) Involutory

51. An operator precedence parser is a :

(A) Bottom-up parser

(B) Top-down parser

(C) Back tracking parser

(D) None of these

52. If a high speed 40 ns memory cache has a successful hit ratio of 80%, and regular memory has an assess time of 100 ns, then the average effective time for CPU to access memory is approximately :

(A) 60

(B) 70

(C) 40

(D) 50

53. The capacity of a memory unit is defined by the number of words multiplied by the number of bits / word. How many separate address and data lines are needed for a memory of 4K X 16 ?

(A) 10, 16 ·

(B) 11, 8

(C) 12, 16

(D) 12, 12

54. The number of 1s in the binary representation of $(3 * 4096 + 15 *256 + 5*16 + 3)$ are :

(A) 8

(B) 9

(C) 10

(D) 12

55. Assume that each character code consists of 8 bits. The number of characters that can be transmitted per second through an asynchronous serial line at 2400 baud rate, and with two stop bits, is :

(A) 109

(B) 216

(C) 218

(D) 240

56. Consider a system having m resources of the same type. These resources are shared by 3 processes A, B and C, which have peak demands of 3, 4 and 6 respectively. For what value of m deadlock will not occur ?

(A) 7

(B) 9

(C) 10

(D) 13

57. A bag contains 10 white balls and 15 black balls. Two balls are drawn in succession. The probability that one of them is black and the other is white is :

(A) 2/3

(B) 4/5

(C) 1/2

(D) 1/4

58. The postfix expression for

$A + B^* (C + D) / F + D^* E$ is :

(A) $AB + CD + {}^*F / D + E^*$

(B) $ABCD + {}^* F / DE^* ++$

(C) $A^* B + CD / F^* DE ++$

(D) $A + {}^* BCD / F^* DE ++$

59. Two dice are thrown simultaneously. The probability that at least one of them will have 6 facing up is :

(A) 1/36

(B) 1/3

(C) 25/36

(D) 11/36

60. An advantage of chained hash table (external hashing) over the open addressing scheme is :

(A) Worst case complexity of search operations is less

(B) Space used is less

(C) Deletion is easier

(D) None of these

61. Relative mode of addressing is most relevant to writing :

(A) Coroutines

(B) Position-independent code

(C) Shareable code

(D) Interrupt handlers

62. The probability that top and bottom cards of a randomly shuffled deck are both aces is :

(A) 4/52 × 4/52

(B) 4/52 × 3/52

(C) 4/52 × 3/51

(D) 4/52 × 4/51

63. Which of the following is essential for converting an infix expression to the postfix form efficiently ?

(A) An operator stack

(B) An operand stack

(C) Both (A) and (B)

(D) A Parse tree

64. Thrashing :

(A) Reduce page I / O

(B) Decrease the degree of multiprogramming

(C) Implies excessive page I / O

(D) Improve the system performance

65. The number of equivalent relations of the set {1, 2, 3, 4} is :

(A) 15

(B) 16

(C) 24

(D) 4

66. Which of the following devices should get higher priority in assigning interrupts ?

(A) Hard Disk

(B) Printer

(C) Keyboard

(D) Floopy disk

67. When the result of a computation depends on the speed of the processes involved there is said to be ?

(A) Cycle stealing

(B) Race condition

(C) A time lock

(D) A deadlock

68. Many operating system directory structures are _____

(A) Discrete

(B) Disparate

(C) Virtual

(D) Hierarchical

69. A process is selected from _____ the queue by the _____ scheduler, to be executed.

(A) Blocked, short-term

(B) Wait, long-term

(C) Ready, short-term

(D) Ready, long-term

70. Consider the following set of processes the length of the CPU burst time given in milliseconds :

Process Burst time
P1   6
P2   8
P3   7
P4   3

Assuming the above process being scheduled with the SJF scheduling algorithm. Select the best suitable answer :

(A) The waiting time for process P1 is 3 ms

(B) The waiting time for process P1 is 0 ms

(C) The waiting time for process P1 is 16 ms

(D) The waiting time for process P1 is 9 ms

71. Which of the following statements are true ?

(i) Shortest remaining time first scheduling may cause starvation

(ii) Pre-emptive scheduling may cause starvation

(iii) Round robin is better than FCFS in terms of response time :

(A) (i) only

(B) (i) and (iii) only

(C) (ii) and (iii) only

(D) (i), (ii) and (iii) only

72. Which of the following symbol table implementation has the minimum access time ?

(A) Hash table

(B) Search tree

(C) Linear list

(D) Self-organizing list

73. The concatenation of two lists is to be performed in O(1) time. Which of the following implementations of a list should be used ?

(A) Singly linked list

(B) Doubly linked list

(C) Circular doubly linked list

(D) Array implementation of list

74. Which of the following is essential for converting in infix expression to the postfix form efficiently ?

(A) An operator stack

(B) An operand stack

(C) Both (A) and (B)

(D) A parse tree

75. Consider the usual algorithm for determining whether a sequence of parentheses is balanced. The maximum number of parentheses that appear on the stack **at any one time** when the algorithm analyzes (() (()) (())) are :

(A) 1

(B) 2

(C) 3

(D) 4 or more

76. Which of the following addressing modes, fascinates access to an operand whose location is defined relative to the beginning of the data structure in which it appears ?

(A) Absolute

(B) Immediate

(C) Index

(D) Indirect

77. Fork is :

(A) Creation of a new job

(B) Dispatch of a task

(C) Increase the priority of task

(D) Creation of a new process

78. The principle of locality justifies the use of :

(A) Interrupts

(B) DMA

(C) Polling

(D) Cache Memory

79. Which scheduling policy is most suitable for a time-shared operating system ?

(A) SJF

(B) Round Robin

(C) FCFS

(D) Elevator

80. Dijkstra's banker's algorithm in an operating system solves the problem of :

(A) Deadlock Avoidance

(B) Deadlock Recovery

(C) Mutual Exclusion

(D) Context Switching

81. Which is correct ?

(A) $O(\log n) < O(n) < O(n \log n) < O(2^n) < O(n^2)$

(B) $O(n) < O(\log n) < O(n \log n) < O(2^n) < O(n^2)$

(C) $O(n) < O(\log n) < O(n \log n) < O(n^2) < O(2^n)$

(D) $O(\log n) < O(n) < O(n \log n) < O(2^n) < O(2^n)$

82. Consider the following definition is C programming language :

```
struct node
{
        int data;
        struct node * next ;
}
```

typedef struct node NODE;

NODE *ptr;

Which of the following C code is used to create new node ?

(A) ptr = (NODE*) malloc (sizeof (NODE));

(B) ptr = (NODE*)malloc(NODE);

(C) ptr = (NODE*) malloc (sizeof (NODE*));

(D) ptr = (NODE) malloc (sizeof (NODE));

83. What does the following function do for a given Linked List with first node as head ?

```
void fun1 (struct node* head)
{
        if(head == NULL)
        return;
                fun1 (head → next);
                printf ("%d", head → data);
}
```

(A) Prints all nodes of linked lists

(B) Prints all nodes of linked list in reverse order

(C) Prints alternate nodes of Linked List

(D) Prints alternate nodes in reverse order

84. In the worst case, the number of comparisons needed to search a singly linked list of length n for a given element is :

(A) log 2n

(B) n / 2

(C) log 2n – 1

(D) n

85. CPI depends on :

(A) ISA and organization

(B) ISA and compiler technology

(C) Hardware technology and organization

(D) None of these

86. Coarse grained is :

(A) Process-level

(B) Thread-level

(C) Instruction-level

(D) None of these

87. Virtual memory replacement is the operating system, whereas replacement on cache memory misses by hardware.

(A) False

(B) True

(C) Can't say

(D) None of these

88. Which of the following is false about a circular linked list ?

   (A) Every node has a successor

   (B) Time complexity of inserting a new node at the head of the list is O(1)

   (C) Time complexity for deleting the last node is O(n)

   (D) We can traverse the whole circular linked list by starting from any point

89. What is the value of the postfix expression 6 3 2 4 + − * ?

   (A) 1

   (B) 40

   (C) 74

   (D) − 18

90. State which of the following required to store a picture in database ?

   (A) BLOB

   (B) Text

   (C) Image

   (D) Logical

91. A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is :

   (A) log n

   (B) $n - 1$

   (C) n

   (D) 2^n

92. Dynamic Address Translation :

   (A) Is part of the operating system paging algorithm

   (B) Is useless when swapping is used

   (C) Is the hardware necessary to implement paging

   (D) Stores pages at a specific location on disk

93. The probability that a number selected at random between 100 and 999 (both inclusive) will not contain the digit 7 is :

   (A) 16/25

   (B) 9/10

   (C) 27/75

   (D) 18/25

94. The minimum number of edges in a connected cyclic graph on n vertices is :

   (A) $n - 1$

   (B) n

   (C) $n + 1$

   (D) None of these

95. The LRU algorithm :

(A) Pages out pages that have not been used recently

(B) Pages out pages that have been used recently

(C) Pages out pages that have been least used recently

(D) Pages out the first page in a given area

96. How many substring of different lengths (non-zero) can be formed from a character string length n ?

(A) n

(B) n^2

(C) 2n

(D) $n(n + 1) / 2$

97. A Microprogrammed control unit :

(A) Is faster than a hard-wired control unit

(B) Facilitates easy implementation of new instructions

(C) Is useful when very small programs are to be run

(D) Usually refers to the control unit of a microprocessor

98. Data dictionary describes :

(A) What files are in the database

(B) What attributes are possessed by the data

(C) What these files contain

(D) All of these

99. The value of k for which $4x^2 - 8xy + ky^2 = 0$ does not represent a pair of straight lines (both passing through the origin) is :

(A) 0

(B) 2

(C) 9

(D) 3

100. Given :

T(n) = n! and T(1) = 1,

T(n) = O(?)

(A) n^n

(B) log n

(C) log (log n)

(D) n log n

Hint : For the formal definition, suppose f(x) and g(x) are two functions defined on some subset of the real numbers. We write f(x) = O(g(x))

iff there exist constants N and C such that $|f(x)| <= C |g(x)|$ for all x > N

■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

SPACE FOR ROUGH WORK