COMPUTER SCIENCE AND APPLICATIONS

Name & Signature of the Invigilator .....

.....

PAPER – II

CODE-19

OMR Answer Sheet No. :

Roll No. :

(in figures as in Hall Ticket)

Roll Number in words : .....

.....

190534

Question Booklet Sl. No.

Time : 2 Hours] **No. of Printed Pages : 24** **[Maximum Marks : 200**

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of **one hundred (100)** multiple choice type of questions. **All** questions are compulsory.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker seal and do not accept an open booklet.
   (ii) Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
   (iii) After this verification is over, the Test Booklet Number should be entered on the OMR Answer Sheet and the OMR Answer Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the oval as indicated below on the correct response against each item.

   Example: (A) ● (C) (D) where (B) is the correct response.
5. Your responses to the items are to be indicated on the OMR Answer Sheet under Paper – II only. If you mark your response at any place other than in the oval in the OMR Answer Sheet, it will not be evaluated.
6. Rough Work is to be done in the end of this booklet.
7. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
8. You have to return the original OMR Answer Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet and duplicate copy of OMR Answer Sheet on conclusion of examination.
9. Use only Blue/Black Ball point pen.
10. Use of any calculator or any electronic devices or log table etc., are prohibited.
11. There shall be no negative marking.

SEAL

પરીક્ષાર્થીઓ માટે સૂચનાઓ

1. આ પાનાની ટોચ પર દર્શાવેલી જગ્યામાં તમારો રોલ નંબર લખો.
2. આ પ્રશ્નપત્રમાં બહુવૈકલ્પિક ઉત્તરો ધરાવતા સો (૧૦૦) પ્રશ્નો આપેલા છે. બધા જ પ્રશ્નો ફરજિયાત છે.
3. પરીક્ષાની શરૂઆતમાં આપને પ્રશ્નપુસ્તિકા આપવામાં આવશે. પ્રથમ પાંચ (૫) મિનિટ દરમ્યાન તમારે પ્રશ્નપુસ્તિકા ખોલી અને ફરજિયાતપણે નીચે મુજબ પરીક્ષણ કરવું :
   (i) પ્રશ્નપુસ્તિકાનો વપરાશ કરવા માટે આ કવર પૃષ્ઠની ધાર પર આપેલ સીલ સ્ટીકર ફાડી નાખો. કોઈપણ સંજોગોમાં સીલ સ્ટીકર વગરની કે ખુલ્લી પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં.
   (ii) કવર પૃષ્ઠ પર છપાયેલ નિર્દેશાનુસાર પ્રશ્નપુસ્તિકાના પ્રશ્નો, પૃષ્ઠો અને સંખ્યાને બરાબર ચકાસી લો. ખામીયુક્ત પ્રશ્નપુસ્તિકા કે જેમાં પ્રશ્નો/ પૃષ્ઠો ઓછાં હોય, બે વાર છપાયા હોય, અનુક્રમમાં અથવા અન્ય કોઈ ફરક હોય અર્થાત કોઈપણ સંજોગોમાં ખામીયુક્ત પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં. અને જો ખામીયુક્ત પ્રશ્નપુસ્તિકા મળી હોય તો નિરીક્ષક પાસેથી તુરંત જ બીજી સારી પ્રશ્નપુસ્તિકા મેળવી લેવી. આ માટે ઉમેદવારને પાંચ (૫) મિનિટનો સમયગાળો આપવામાં આવશે. પછીથી, પ્રશ્નપુસ્તિકા બદલવામાં આવશે નહીં કે કોઈ વધારાનો સમયગાળો આપવામાં આવશે નહીં.
   (iii) આ ચકાસણી સમાપ્ત થાય પછી, પ્રશ્નપુસ્તિકાનો નંબર OMR જવાબ પત્રક પર લખવો અને OMR જવાબ પત્રકનો નંબર પ્રશ્નપુસ્તિકા પર લખવો.
4. પ્રત્યેક પ્રશ્ન માટે ચાર જવાબ વિકલ્પ (A), (B), (C) અને (D) આપવામાં આવેલ છે. તમારે સાચા જવાબના ઓવલ (oval)ને નીચે આપેલ ઉદાહરણ મુજબ પેનથી ભરીને સંપૂર્ણ કાળું કરવાનું રહેશે.
   ઉદાહરણ : (A) ● (C) (D) કે જ્યાં (B) સાચો જવાબ છે.
5. આ પ્રશ્નપુસ્તિકાના પ્રશ્નોના જવાબ અલગથી આપવામાં આવેલ OMR જવાબ પત્રકમાં પેપર-II લખેલ વિભાગમાં જ અંકિત કરવા. જો આપ OMR જવાબ પત્રકમાં આપેલ ઓવલ (oval) સિવાય અન્ય સ્થાને જવાબ અંકિત કરશો તો તે જવાબનું મૂલ્યાંકન કરવામાં આવશે નહીં.
6. કાચું કામ (Rough work) પ્રશ્નપુસ્તિકાના અંતિમ પૃષ્ઠ પર કરવું.
7. જો આપ OMR જવાબ પત્રક નિયત જગ્યા સિવાય અન્ય કોઈપણ સ્થાને, આપનું નામ, રોલ નંબર, ફોન નંબર અથવા એવું કોઈ ચિહ્નક જેનાથી તમારી ઓળખ થઈ શકે, અંકિત કરશો અથવા અભદ્ર ભાષાનો પ્રયોગ કરો, અથવા અન્ય કોઈ અનુચિત સાધનોનો ઉપયોગ કરો, જેમકે અંકિત કરી દીધેલ જવાબ ભૂંસી નાખવો કે સફેદ શાહીનો ઉપયોગ કરી બદલશો તો આપને પરીક્ષા માટે અયોગ્ય જાહેર કરવામાં આવશે.
8. પરીક્ષા સમય પૂરો થઈ ગયા બાદ ઓરીજીનલ OMR જવાબ પત્રક જે તે નિરીક્ષકને ફરજિયાત સોંપી દેવું અને કોઈ પણ સંજોગોમાં તે પરીક્ષા ખંડની બહાર લઈ જવું નહીં. પરીક્ષા પૂર્ણ થયા બાદ ઉમેદવાર ઓરીજીનલ પ્રશ્નપુસ્તિકા અને OMR જવાબ પત્રકની ડુપ્લિકેટ કોપી પોતાની સાથે લઈ જઈ શકે છે.
9. માત્ર કાળી / ભૂરી બૉલ પૉઈન્ટ પેન વાપરવી.
10. કેલ્કયુલેટર,લોગ ટેબલ અને અન્ય ઈલેક્ટ્રોનિક યંત્રોનો ઉપયોગ કરવાની મનાઈ છે.
11. ખોટા જવાબ માટે નકારાત્મક ગુણાંકન પ્રથા નથી.

A3201

DO NOT WRITE HERE

COMPUTER SCIENCE AND APPLICATIONS
Paper - II

1. In propositional logic, which of the following assertions is a tautology ?

(A) $P \Leftrightarrow (P \vee Q)$ (B) $(P \wedge Q) \Leftrightarrow (P \vee Q)$

(C) $(P \Rightarrow Q) \Leftrightarrow \neg(P \wedge \neg Q)$ (D) $(P \Rightarrow Q) \Leftrightarrow (P \vee \neg Q)$

2. Which of the following assertions is valid in the Calculus of Predicates for any universe and any interpretation of the predicates involved ?

(A) $\forall x[P(x) \Rightarrow Q(x)] \Leftrightarrow [\forall xP(x) \Rightarrow \forall xQ(x)]$

(B) $[\exists xP(x) \wedge \exists xQ(x)] \Leftrightarrow \exists x[P(x) \wedge Q(x)]$

(C) $[\forall xP(x) \wedge \forall xQ(x)] \Leftrightarrow \forall x[P(x) \wedge Q(x)]$

(D) $[\forall xP(x) \vee \forall xQ(x)] \Leftrightarrow \forall x[P(x) \vee Q(x)]$

3. Which pair of rules of inference are used in the following argument ?

"All students understand propositional logic.

Ketan is a student.

Therefore, Ketan understands propositional logic."

(A) Universal Generalization and Modus Ponens

(B) Existential Specification and Modus Ponens

(C) Universal Specification and Modus Tollens

(D) Universal Specification and Modus Ponens

4. How many bit strings of length eight either start with the three bits 101 or end with the two bits 10 ?

(A) 88 (B) 112

(C) 128 (D) 74

5. How many numbers must be selected from the set {1, 2, 3, 4, 5, 6, 7, 8} to guarantee that at least one pair of these selected numbers add up to 9 ?

(A) 3 (B) 4

(C) 5 (D) 6

6. Let G be a complete graph of n vertices. What is the maximum value for n for which G is planar ?

(A) 3 (B) 4

(C) 5 (D) 6

7. If you are given a NOR-to-NOR two-level gate network to implement a boolean function, then to which of the following gate network form can it be directly transformed by just replacing every gate in the network by a different type of gate ?

(A) NAND-to-NAND (B) NOR-to-NAND

(C) OR-to-AND (D) AND-to-OR

8. A company has 3 plants A, B, C and 3 warehouses X, Y, Z. Number of units available at plants is 60, 70 and 80 respectively and demands at warehouses are 50, 80 and 80 respectively. Unit costs of transportation are as follows :

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} X & Y & Z \end{array} \\ \begin{pmatrix} 8 & 7 & 3 \\ 3 & 8 & 9 \\ 11 & 13 & 5 \end{pmatrix} \end{array}$$

Then the solution $x_{13} = 60$, $x_{21} = 50$, $x_{23} = 20$ and $x_{32} = 80$ is of the following nature :

(A) Degenerate and optimal

(B) Non-degenerate and optimal

(C) Non-degenerate and not basic feasible

(D) Degenerate, basic feasible but not optimal

9. Which of the following statements is/are true ?

I. Every subgroup is a group.

II. Every semigroup is a group.

III. Every ring is a field.

(A) I only (B) I and II

(C) I and III (D) II and III

10. Consider the following statements :

I. The set of natural numbers $\mathbb{N}$ with the addition operation forms a group.

II. The set of integers $\mathbb{Z}$ with the multiplication operation forms a semigroup.

III. The set of non-empty strings with the concatenation operation forms a monoid.

Which of the following is true ?

(A) II only (B) I and II

(C) I and III (D) II and III

11. If a system represents signed integers in 8-bit 2's component form , what is the value represented by the hexadecimal representation AB ?

(A) 85 (B) –171 (C) 171 (D) –85

12. If the 32-bit representation of a floating point number according to the IEEE 754 standard is given by the hexadecimal digit sequence A6B7C8D9, what is the hexadecimal representation of the 8-bits that constitute the exponent part in the number ?

(A) A6 (B) 6B

(C) 4D (D) AB

13. Which of the following is false for Pipelining ?

(A) Cycle time of the processor in the Pipelining is reduced

(B) Instruction throughput is increased in the Pipelining

(C) Several instructions executed parallely referring to the same data is not a problem in Pipeline

(D) Data dependency is one of the conflicts in Pipelining

14. Which one of the following is not true for Array processors ?

(A) Array processors have their own memory

(B) All processors of the Array processor share the same Control Unit

(C) Array processors are good for applications of the form matrix or vector

(D) Array processors perform sequence of scalar operations

15. If a Microprocessor has a RAM of 16 MB and can address individual bytes in the RAM, what is the minimum number of lines in its address bus ?

(A) 16 (B) 20

(C) 24 (D) 28

16. Assume that the binary equivalent of integer value 750 is stored in a 16-bit Shift -Right register. What will be the value (in hexadecimal) in the register after the Shift-Right operation is carried out on it twice ?

(A) 02EE

(B) 00BB

(C) 0177

(D) 01B9

17. What is the addressing mode of a Machine Language instruction in which the memory address of data is given as an operand in the instruction ?

(A) Immediate addressing

(B) Register addressing

(C) Direct addressing

(D) Indirect addressing

18. Which of the Flip-Flops is called a transparent latch ?

(A) SR Flip-Flop

(B) Master-Slave Flip-Flop

(C) D Flip-Flop

(D) JK Flip-Flop

19. Which of the following logic gates recognises even parity of its input bits ?

(A) XNOR (B) XOR

(C) NAND (D) NOR

20. What is the role of a ring counter in the control unit of a computer ?

(A) It guides execution of loops in a program

(B) It counts the number of memory accesses during an instruction

(C) It acts as a binary counter

(D) It specifies the T state of the instruction execution

21. What will be the output of following code segment ?

```
int main( )
{
   long int i, a[5] ;
   for(i=0; i<5; i++)
      a[i]=&a[i+l] –&a[i];
   printf("%ld,%ld,%ld,%ld",a[3] ,3[a] ,*(a+3) ,*(&a[3]));
}
```

(A) 1,1,1,1 (B) 2,2,2,2

(C) 4,4,4,4 (D) Compiler Error

22. Consider the following program :

```
#include<stdio.h>
#define square(a) a*a
int main( )
{
   int i=5, j=10;
   printf("square=%d\n" , square(i+j));
}
```

The output is :

(A) 65 (B) 225

(C) 60 (D) 25

23. Consider the following program :

```
#include<stdio.h>
void e(int) ;
main( )
{
   e(3) ;
}
void e(int n)
{
   if(n>0)
   {
      e(--n);
      printf("%d" ,n);
      e(--n);
   }
}
```

The output of this program is :

(A) 0 1 2 0 (B) 0 1 2 1

(C) 1 2 0 1 (D) 0 2 1 1

24. Usually a pure virtual function in C++

(A) Uses virtual memory

(B) Has a complete function body

(C) Is defined only in a derived class

(D) Has only public variables

25. In C++, the *this* pointer can be used directly to

(A) Manipulate self-referential data structures

(B) Manipulate any reference to pointers to member functions

(C) Manipulate class references

(D) Manipulate and disable any use of pointers

26. Which of the following homogenous coordinates does not represent a point at infinity ?

(A) (1, 10, 0) (B) (0, 0, 1)

(C) (10, 10, 0) (D) (15, 7, 0)

27. Why is the Bresenham's line drawing algorithm faster than the DDA line drawing algorithm ?

(A) It uses floating point operations instead of integer addition and subtraction

(B) It considers only selected range inputs

(C) It uses integer addition and subtraction instead of floating point operations

(D) It uses binary search for faster computation of plotting points

28. A system with 24 bits per pixel has screen resolution of 1024 × 768. Calculate the size of frame buffer (in KBytes).

(A) 2304 Kb

(B) 768 Kb

(C) 2032 Kb

(D) 1920 Kb

29. In the Cohen Sutherland line clipping algorithm, if the codes of the two points P and Q are 0101 and 0001 respectively, then the line segment joining the points P and Q will be _____ the clipping window.

(A) Totally outside

(B) Partially outside

(C) Totally inside

(D) On the boundary

30. In 2D graphics, if S_1 and S_2 are two distinct scaling matrices, R_1 and R_2 are two distinct rotation matrices and T_1 and T_2 are two distinct translation matrices then

(A) $S_1S_2 = S_2S_1$

(B) $S_1T_1 = S_2T_2$

(C) $T_2R_2 = R_2T_2$

(D) $S_1T_1 = T_1S_1$

31. Consider the following statements about Assertions in the database :

i. Domain and Referential integrity constraints are special forms of assertions.

ii. SQL provides DML to define assertions.

iii. Assertions are expressions that require always to be true.

iv. It is possible to write assertions, may not be many complex ones, that enforce a Functional dependency.

Which one from the following is true for the above statements ?

(A) Statements ii and iii are true

(B) Statement i is false

(C) Statement ii is false

(D) Statements i and iv are false

32. Consider the following statements of a Normalization in the database :

i. Normalization can be described as the removal of duplication.

ii. Normalization can be described as minimizing redundancy.

iii. Normalization can be described as the introduction of granularity.

iv. Too much minimization of redundancy by normalization implies too little granularity.

Which of the following statements is true for the above statements ?

(A) Statement i and iv both are false

(B) Statement iii and iv both are false

(C) Statement ii and iii both are true

(D) Only statement iii is false

33. SQL does not provide a way of specifying Functional dependencies, except for

(A) Super keys by using the Primary key or unique constraints

(B) Primary keys by using the Superkey

(C) Primary keys by using the unique constraints

(D) Super keys by using the derived attributes

34. Consider the following statements about the Deductive database :

i. Deductive databases are less expressive than Relational databases.

ii. Deductive database system stores rules and facts in the deductive database to infer information.

iii. Deductive databases allow time-based reasoning.

Which of the following statements is true for the above statements ?

(A) Only statement ii is true

(B) Only statement iii is true

(C) Statement i and iii both are true

(D) Only statement i is true

35. Consider the following statements about Cardinality in the Relational models :

i. Cardinality in the relational models indicates the number of tuples.

ii. Cardinality in the relational models indicates the number of constraints.

iii. One of the types of cardinality is many-to-many cardinality.

Which of the following statements is true for the above statements ?

(A) Statement i and iii both are false

(B) Only statement ii is true

(C) Statement ii and iii both are false

(D) Only statement ii is false

36. A Support Vector Machine in data mining

(A) performs clustering by finding the hyperplane (i.e. support vectors) that maximizes the margin between the two classes

(B) performs classification by finding the hyperplane (i.e. support vectors) that minimizes the margin between the two classes

(C) performs classification by finding the hyperplane (i.e. support vectors) that maximizes the margin between the two classes

(D) performs clustering by finding the hyperplane (i.e. support vectors) that minimizes the margin between the two classes

37. What does the following statement do ?

```
UPDATE employees AS P
SET promotion = True WHERE P.emp_no IN (SELECT emp_no FROM
(SELECT emp_no, count(*) as total
FROM dept_emp GROUP By emp_no HAVING total > 1) AS i
```

(A) The database state will not change

(B) The database state will change because the statement updates the promotion attribute of the employees that changed their job more than once

(C) The database state will change because the statement creates the promotion attribute of the employees that changed their job more than once

(D) The database state will change because the statement sets the promotion attribute of the employees that changed their job

38. An OLAP tool provides

(A) Multidimensional analysis

(B) Rotation

(C) Slicing and Dicing

(D) Both (A) and (C)

39. Storing a separate copy of the database at multiple locations is achieved by

(A) Clustering
(B) Partitioning
(C) Data Replication
(D) Both Clustering and Partitioning

40. Which one from the following will be helpful to reduce the transfer cost by using the semijoin ?

(A) All of the rows are sent from one table to another and then only rows with required attributes are returned
(B) Only the joining attributes are sent from one table to another and then all of the rows are returned
(C) All of the attributes are sent from one table to another and then only the required rows are returned
(D) Only the joining attributes are sent from one table to another and then only the required rows are returned

41. Which of the following statements is (are) true ?

I. Interpreters usually take less amount of time to analyse the source code.
II. Interpreters usually take less amount of time to execute the code.
III. Compilers translate program one statement at a time.

(A) I only (B) I and II (C) I and III (D) II and III

42. What is wrong with the following program that implements Peterson's solution with two processes P0 and P1 ?

```
1.  bool flag [2] = {false, false};
2.  int turn;
    // P0's code                    // P1's code
3.  P0: flag[0] = true;             P1:   flag [1] = true;
4.  P0_g: turn = 0;                 P1_g: turn = 1;
5.        while (flag [1] == true         while (flag [0] == true
6.               && turn == 1)                   && turn == 0)
7.        { // busy wait }          { // busy wait }
8.        // begin CS             // begin CS
9.        ...                     ...
10.       // end CS               // end CS
11.       flag[0] = false;        flag[1] = false;
```

(A) Line 3: P0 should set flag [1] = true and P1 should set flag [0] = true
(B) Line 4: P0 should set turn = 1 and P1 should set turn = 0
(C) Line 6: P0 should check turn == 0 and P1 should check turn == 1
(D) There is nothing wrong with the above code

43. A deadlock occurs when which of the following set of conditions hold true ?

(A) Mutual Exclusion, Hold and Wait, Preemption, Bounded Waiting

(B) Mutual Exclusion, Starvation, No preemption, Circular Wait

(C) Mutual Exclusion, Hold and Wait, No preemption, Circular Wait

(D) Critical Section, Hold and Wait, No preemption, Bounded Waiting

44. Consider the priorities, arrival times, burst times of P1-P4 :

Process	Priority	Arrival Time	Burst Time
P1	1	0	4
P2	2	0	3
P3	1	6	7
P4	3	11	4

What will be the order of completion based on preemptive priority scheduling ?

(A) P1, P2, P4, P3 (B) P2, P4, P1, P3

(C) P1, P3, P2, P4 (D) P1, P2, P3, P4

45. Consider a serial program in two parts A and B for which the time taken by A, T_A = 3s and the time taken by B, T_B = 1s. Now suppose B can be executed in parallel on 5 processing cores, then the speedup based on Amdahl's law will be

(A) 2.50 (B) 1.25 (C) 1.60 (D) 1.40

46. Which of the following statements is (are) true regarding network operating systems ?

I. Each node or system must have the same operating system.

II. Communication takes place on the basis of files.

III. They are less scalable than distributed operating systems.

(A) I only (B) II only

(C) III only (D) II and III

47. Which of the following statements is (are) true about free space management ?

I. Bit map requires extra space.

II. In grouping method, free disk blocks can be found quickly.

III. In the counting method, it is not easy to get contiguous files.

(A) I only (B) I and II

(C) I and III (D) II and III

48. Which of the following statements is (are) true ?

I. After loading a kernel module, the system needs to be rebooted.

II. A kernel module may typically implement a device driver, a file system, but not a networking protocol.

III. The disadvantage of loadable kernel modules is that it incurs a fragmentation penalty.

(A) I and II
(B) I and III
(C) II and III
(D) III only

49. Which of the following is not a routing strategy ?

(A) Physical routing
(B) Fixed routing
(C) Virtual routing
(D) Dynamic routing

50. Which of the following is/are not a Unix file type ?

I. FIFO

II. Socket

III. Inode

IV. Symbolic link

(A) II only
(B) III only
(C) I and III
(D) II and IV

51. All operations that access the same data should be defined within one class. Which type of cohesion is designed with this objective ?

(A) Functional
(B) Temporal
(C) Layer
(D) Communicational

52. Software quality factors covered under the Software Product Transition are

(A) Reliability, Reusability and Maintainability
(B) Reusability, Interoperability and Portability
(C) Portability, Integrity and Flexibility
(D) Correctness, Interoperability and Testability

53. Consider a software system in which we would like to know whether how many components/modules are interacting with each other. Which design will be helpful to get the answer ?

(A) Architectural Design
(B) Component-level Design
(C) Coupling
(D) Modularity

54. Which activities from the following are encompassed by a generic (Software Engineering) process framework ?

(A) Communication, Planning, Modeling, Testing and Deployment

(B) Communication, Measurement, Modeling and Construction

(C) Planning, Modeling, Risk Management and Deployment

(D) Communication, Planning, Modeling, Construction and Deployment

55. Information about why, by whom and when changes are made in software is provided by

(A) A Change Control

(B) A Version Control

(C) An Audit Trial

(D) A Software Configuration Management

56. Consider the following objectives :

i. To identify all items that collectively define the software configuration.

ii. To ensure that software quality is maintained as the configuration evolves over time.

iii. To facilitate the construction of different versions of an application.

Who is responsible to achieved the above objectives ?

(A) Version Control Management

(B) Quality Management

(C) Configuration Management

(D) Version Change Control

57. Maximum cohesion and minimum coupling in object oriented design can be achieved by

(A) Inheritance

(B) Encapsulation

(C) Polymorphism

(D) Abstraction

58. Improving processing efficiency or performance or restructuring of software to improve changeability is known as

(A) Perfective Maintenance

(B) Adaptive Maintenance

(C) Corrective Maintenance

(D) Preventative Maintenance

59. Which of the testing techniques ensures that the software runs correctly after code modification during maintenance ?

(A) Functional Testing
(B) Integration Testing
(C) Regression Testing
(D) System Testing

60. The Association rules in data mining

(A) Are used to discover the dependency relationships through attributes
(B) Are used to discover independence through attributes
(C) Select those item sets which satisfy minimum support and confidence specified by the user
(D) Both (A) and (C)

61. Identify the data structure (among the following ones) that consumes the least amount of storage space to store a set of n integers. Assume that n is large.

(A) Directed graph
(B) Singly linked list
(C) Max heap
(D) AVL tree

62. A binary min-heap is made by including each integer in interval [1, 511] exactly once. The depth of a node in the heap is the length of the path from the root of the heap to that node. Thus, the root is at depth 0. The minimum and maximum depths at which integer 7 can appear are

(A) 1 and 6
(B) 1 and 5
(C) 2 and 6
(D) 2 and 5

63. The smallest number of keys that will force a B-tree of order 3 to have a height 3 is (level of root is zero)

(A) 16 (B) 13 (C) 7 (D) 15

64. A tree is a special form of graph. For a tree T containing 10 nodes, how many zero entries will be there in the adjacency matrix representation of T ?

(A) 91 (B) 82 (C) 90 (D) 80

65. A hash table of length 10 uses open addressing with hash function h(k)=k mod 10, and linear probing. The 6 values 42, 23, 34, 52, 46 and 33 are stored in the table at index positions 2, 3, 4, 5, 6 and 7 respectively. Which one of the following choices gives a possible order in which the key values could have been inserted in the table ?

(A) 46, 42, 34, 52, 23, 33
(B) 34, 42, 23, 52, 33, 46
(C) 46, 34, 42, 23, 52, 33
(D) 42, 46, 33, 23, 34, 52

66. The following three, in arbitrary order, are the preorder, inorder and postorder sequences of an AVL tree.

I. MBCAFHPYK

II. KAMCBYPFH

III. MABCKYFPH

Pick the true statement from the following :

(A) I and II are preorder and inorder sequences, respectively

(B) I and III are preorder and postorder sequences, respectively

(C) II is the inorder sequence, but nothing more can be said about the other two sequences

(D) II and III are the preorder and inorder sequences, respectively

67. Consider the QuickSort algorithm which sorts elements in ascending order using the first element as pivot. Then which of the following input sequence will require a maximum number of comparisons when this algorithm is applied on it ?

(A) 12 22 25 56 67 89

(B) 25 22 12 89 67 56

(C) 22 25 76 67 50 12

(D) 22 15 12 89 67 76

68. Which of the following is not a property of the dynamic programming design technique ?

(A) Optimal substructure

(B) Overlapping subproblems

(C) Bottom up approach

(D) Dynamic memory allocation

69. The upper bound on the time complexity of the non-deterministic sorting algorithm is _____ , while the lower bound on the time complexity of comparison based deterministic sorting algorithms is _____ .

(A) O(n), O(n log n)

(B) O(n log n), $O(n^2)$

(C) O(log n), O(n)

(D) O(1), O(log n)

70. Which of the following statements are true ?

I. The problem of determining Minimum Spanning Tree of an undirected graph is in P.

II. The problem of determining Minimum Spanning Tree of an undirected graph is in NP.

III. The Travelling Salesman Problem is NP-Complete.

(A) I, II and III

(B) I and III

(C) II and III

(D) I and II

71. Let L be the language that consists of all strings that contain an equal number of a's and b's. Let M be the regular language a*b*. Which of the following is (are) true ?

I. $L \cap M$ is a context-free language.

II. $L \cap M$ is a regular language.

III. $L \cup M$ is not context-free language.

(A) I only

(B) I and II

(C) I and III

(D) II and III

72. The concept of Finite State Automata is commonly used in this part of the compiler

(A) Lexical analysis

(B) Parser

(C) Code generation

(D) Code optimization

73. Which of the following conversion is not possible (algorithmically) ?

(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

74. Using a suitable Pumping Lemma, one can

(A) Prove that a language is regular

(B) Prove that a language is context-free

(C) Prove that a language is context-free but not regular

(D) Disprove that a language is context-free

75. Consider a language L for which there exists a Turing Machine (TM), T, that accepts every word in L and either rejects or loops for every word that is not in L. The language L is

(A) NP hard

(B) NP complete

(C) Recursive

(D) Recursively enumerable

76. Which of the following regular expressions denotes a language comprising of all possible strings over $\Sigma = \{a, b\}$ of length n, where n is a multiple of 3 ?

(A) (a + b + aa + bb + aba + bba)*

(B) (aaa + bbb)*

(C) ((a + b) (a + b) (a + b))*

(D) (aaa + ab + a) + (bbb + bb + a)

77. Which of the following statements is/are true ?

I. The diagonalisation argument can be used to prove that: There exist languages that are not Turing recognizable.

II. The diagonalisation argument cannot be used to prove that: The halting problem is undecidable.

III. The diagonalisation argument can be used to prove that: The set of real numbers is larger than the set of integers.

(A) II only (B) I and II (C) I and III (D) II and III

78. Which of the following statements is/are true ?

I. Top-Down Parsing is based on Left Most Derivation.

II. LL(1) is a deterministic parser.

III. LL(2) is a top-down parser.

(A) I only (B) I and II

(C) I and III (D) II and III

79. Which of the following is true ?

(A) Every subset of a regular set is regular

(B) Every finite subset of a non-regular set is regular

(C) The union of two non-regular sets is not regular

(D) Infinite union of finite sets is regular

80. For the following CFG :

$S \rightarrow aB \mid bA$

$B \rightarrow b \mid bS \mid aBB$

$A \rightarrow a \mid aS \mid bAA$

Consider the following derivation :

$S \Rightarrow aB$

$\Rightarrow aaBB$

$\Rightarrow aaBb$

$\Rightarrow aabSb$

$\Rightarrow aabbAb$

$\Rightarrow aabbab$

This derivation is

(A) A leftmost derivation

(B) A rightmost derivation

(C) Both leftmost and rightmost derivation

(D) Neither leftmost nor rightmost derivation

81. Which OSI reference model layer is concerned with Packets, Congestion control and Routing but not with Error Control ?

(A) Network layer
(B) Data Link layer
(C) Physical layer
(D) Session layer

82. Router and Bridge work at

(A) Network and Data link layer respectively
(B) Physical layer (both)
(C) Network and Application layer respectively
(D) Transport and Data link layer respectively

83. Which OSI reference model layer is concerned with Framing, Error and Flow control but not with Line as well as Channel coding and modulation ?

(A) Network layer
(B) Data Link layer
(C) Physical layer
(D) Presentation layer

84. Which protocol from the following work at the Network layer of OSI reference model to communicate information about network connectivity issues (i.e. error and control messages) to the source in connectionless mode ?

(A) ICMP
(B) IGMP
(C) CLNS
(D) DDP

85. A digital signature

(A) Is a bit string giving identity of the parties
(B) Is the unique identification of a sender
(C) Leads to non-replication of transactions by the sender as well as by the receiver
(D) Is an encrypted signature of the receiver

86. For secure EDI transmission on Internet

(A) MIME is used
(B) S/MIME is used
(C) PGP is used
(D) TCP/IP is used

87. Cloud computing service models are arranged as layers in a stack as

(A) SaaS over PaaS over IaaS
(B) SaaS over IaaS over PaaS
(C) PaaS over SaaS over IaaS
(D) PaaS over IaaS over SaaS

88. Consider the following sentences :

I. If DHCP snooping is configured on a LAN switch, then clients having specific MCA and IP addresses can access the network.

II. DHCP is powerful compared to RARP.

III. The DHCP server has no secure mechanism for authenticating the client.

Which one is true ?

(A) I, II and III all are true

(B) I and II are true

(C) II and III are true

(D) I and III are true

89. Which of the following is/are the solutions to network security ?

I. Encryption

II. Authentication

III. Authorization

IV. Repudiation

(A) I, II and III only

(B) II, III and IV only

(C) I, III and IV only

(D) I, II, III and IV

90. Which of the following is/are true ?

I. Public-key cryptography does not require the use of a private key.

II. Public-key cryptography supports non-repudiability.

III. Public-key cryptography relies on a shared-secret between the two parties.

(A) I only

(B) I and III

(C) II only

(D) I, II and III

91. Which of the following is false ?

(A) Genetic algorithms jump from one hill to another due to the Fitness function

(B) Greedy Best-First is neither complete nor optimal

(C) A* can guarantee the shortest path

(D) Greedy search chooses the node for expansion that is one closest to the goal state

92. The problem with Frames and Semantic nets (Knowledge representation techniques) is that

(A) They follow rigid guidelines

(B) There is a lack of formality

(C) It is not possible to use inheritance to derive additional relation/knowledge

(D) It cannot express common sense knowledge

93. If a fuzzy set "temperature is around 75°F" is represented by a membership function :

$$A(x) = \begin{cases} \frac{(x-70)}{4} & \text{if } 70 \le x < 74 \\ 1 & \text{if } 74 \le x \le 76 \\ \frac{(80-x)}{4} & \text{if } 76 < x \le 80 \\ 0 & \text{otherwise} \end{cases}$$

Consider a fuzzy proposition p : Temperature t is around 75°F is very true. Then the truth value of T(p) (79°) is

(A) 0.25 (B) 0.0625 (C) 0.866 (D) 0.5625

94. Let U and V be variables on the sets X = {p, q, r, s} and Y = {1, 2, 3, 4} respectively.

Let S and T be fuzzy sets defined on X and Y as follows :

S = {(p, 0), (q, 0.8), (r, 0.6), (s, 1)}; T = {(1, 0.2), (2, 1), (3, 0.8), (4, 0)}; and let C be a fuzzy set defined on Y having membership grade 1 for all values of y in Y.

Then specify the truth values for the fuzzy proposition :

If U is S then V is T, given that U = q and V = 3.

(Use fuzzy implication relation $R(x, y) = (A \times B) \cup (A^c \times C)$).

(A) 0.8 (B) 0.2 (C) 1 (D) 0.4

95. Look at the following two sentences :

I. The monkey ate the banana because it was hungry.

II. The monkey ate the banana because it was ripe.

In the first sentence 'it' refers to monkey, while in the second sentence 'it' refers to banana. The problem of automatically determining what does 'it' represents in both the sentences, is resolved by

(A) Fuzzy Logic (B) Word Sense Disambiguation

(C) Syntactic Analysis (D) Anaphora Resolution

96. If you ran a module of NLP and gave the following sentence as input: "applicant is removed from list" and got this output [('applicant', 'NN'), ('is', 'VBZ'), ('removed', 'VBN'), ('from', 'IN'), ('list', 'NN')]. Then which module of NLP have you used ?

(A) Part of Speech Tagger
(B) Word Sense Disambiguation
(C) Syntactic Analysis
(D) Anaphora Resolution

97. _____ concerns how sentences are used in different situations and how use affects the interpretation of the sentence.

(A) Part of Speech Tagging
(B) Pragmatics Analysis
(C) Syntactic Analysis
(D) Anaphora Resolution

98. Which of the following statements is/are true ?

I. Linear regression is an example of supervised learning.
II. Classification is an example of unsupervised learning.
III. Clustering is an example of unsupervised learning.

(A) I and II
(B) I only
(C) I and III
(D) I, II and III

99. Which of the following statements is/are true ?

I. Kohonen maps is a type of artificial neural network.
II. Kohonen maps does not use back propagation.
III. Kohonen maps is a supervised learning technique.

(A) I and II
(B) I and III
(C) II and III
(D) I, II and III

100. Which of the following statements is/are true ?

I. The single layer perceptron is an algorithm for learning a binary classifier.
II. If the training set is linearly separable, then the perceptron is guaranteed to converge.
III. A multilayer perceptron (MLP) is a class of feed forward artificial neural network.

(A) II only
(B) I and III
(C) II and III
(D) I, II and III

Space for Rough Work

Space for Rough Work