COMPUTER SCIENCE AND APPLICATIONS

Name & Signature of the Invigilator

.....

.....

PAPER – II

DEC-21/19

OMR Answer Sheet No. :

Roll No. :

(in figures as in Hall Ticket)

Roll Number in words : .....

.....

Question Booklet Sl. No. 190451

Time : 2 Hours] **No. of Printed Pages : 32** **[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 ચિહ્નકે 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 થઈ શકો છો.
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 બોલ પોઈન્ટ પેન વાપરવી.
10. કેલ્કયુલેટર,લોગ ટેબલ અને અન્ય ઈલેક્ટ્રોનિક યંત્રોનો ઉપયોગ કરવાની મનાઈ છે.
11. ખોટા જવાબ માટે નકારાત્મક ગુણાંકન પ્રથા નથી.

DO NOT WRITE HERE

COMPUTER SCIENCE AND APPLICATIONS

Paper – II

1. In propositional logic, which of the following assertions is not a tutology ?

   (A) $P \Rightarrow (P \vee Q)$

   (B) $(P \wedge Q) \Rightarrow (P \vee Q)$

   (C) $(P \vee Q) \Rightarrow (P \wedge Q)$

   (D) $(P \wedge Q) \Rightarrow Q$

2. Which of the following assertions is not valid in the Calculus of Predicates for any universe and any interpretation of the predicates involved ?

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

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

   (C) $\forall xP(x) \Rightarrow \exists xP(x)$

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

3. Which pair of rules of inference are used in the following argument ?
   "All human beings are mortal.
   Socrates is a human being.
   Therefore, Socrates is mortal."

   (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 two bits 10 or end with the two bits 01 ?

   (A) 128 (B) 122

   (C) 112 (D) 256

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

(A) 3 (B) 4

(C) 5 (D) 6

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

(A) 3

(B) 4

(C) 5

(D) 6

7. If you are given a NAND-to-NAND 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) NOR-to-NOR

(B) NOR-to-NAND

(C) OR-to-AND

(D) AND-to-OR

8. Consider the Linear Programming Problem having the following constraints :

a. $2x_1 - x_2 + 3x_3 + x_4 = 7$

b. $3x_1 + x_2 + 3x_3 + 2x_4 = 11$

c. $x_1, x_2, x_3, x_4 \geq 0$;

Then how many basic feasible solutions does this LPP have ?

(A) 6 (B) 4

(C) 5 (D) 8

9. Consider the LPP :

Maximize $2x_1 + 3x_2$

Subject to constraints :

$x_1 + x_2 \geq 4$;

$x_1 + 2x_2 \geq 6$;

$x_1 - x_2 \geq 0$;

If the dual of this LPP has 3 variables y_1, y_2, y_3, which of the following assertions is valid regarding this dual problem and its solutions ?

(A) $y_1, y_2, y_3 \geq 0$ and the problem has a finite optimum solution.

(B) $y_1, y_2, y_3 \geq 0$ and has an unbounded solution.

(C) $y_1, y_2 \geq 0$, y_3 unrestricted and has an unbounded solution.

(D) $y_1, y_2 \geq 0$, y_3 unrestricted and has no feasible solution.

10. The following table gives the activities in a construction project and other relevant data :

Activity i – j	Preceding activities	Normal time (days)	Crash time (days)	Normal cost (Rs.)	Crash cost (Rs.)
1 – 2	–	20	17	600	720
1 – 3	–	25	25	200	200
2 – 3	1 – 2	10	8	300	440
2 – 4	1 – 2	12	6	400	700
3 – 4	1 – 3, 2 – 3	5	2	300	420
4 – 5	2 – 3, 3 – 4	10	5	300	600

Then normal project completion time, Minimum project completion time and Additional cost required to achieve this minimum time are respectively given by

(A) 45, 32, 980

(B) 45, 40, 0

(C) 45, 32, 960

(D) 40, 28, 980

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

(A) –4 (B) –5 (C) 5 (D) –6

12. If the 32-bit representation of a floating point number according to the IEEE 754 standard is given by the hexadecimal digit sequence 9BD2C58A, what is the hexadecimal representation of the 8-bits that constitute the exponent part in the number ?

(A) 37 (B) 3A

(C) 9B (D) BD

13. In microprogrammed control, what type of instructions are stored in a Control ROM ?

(A) Machine Language Instructions

(B) Assembly Language Instructions

(C) Microprogram Instructions

(D) C Program Statements

14. At any time of execution of a program, which of the following is stored in the Program Counter ?

(A) A control word

(B) A machine language instruction

(C) An address from address ROM

(D) A memory address

15. If a ring counter has 8 Flip-Flops in it, how many different 8-bit values can be represented by it ?

(A) 256 (B) 128

(C) 8 (D) 64

16. Consider the following statements about computer system architecture :

I. Array processor uses multiple synchronized ALUs (i.e. Processing units) to achieve spatial parallelism with a lock-step operation.

II. Processors operate asynchronously in array processing.

III. Pipeline processing improves Throughput.

Which of the following is true ?

(A) Statements (I) and (III) are true

(B) Statements (I) and (II) are true

(C) Only Statement (III) is true

(D) Statements (II) and (III) are true

17. Which one of the following is true for Array and Vector processors ?

(A) Array and Vector processors fall under the categories of SISD and SIMD respectively.

(B) Array and Vector processors fall under the categories of SIMD and SISD respectively.

(C) Array and Vector processors both fall under the categories of MIMD.

(D) Array and Vector processors both fall under the categories of SIMD.

18. Which one of the following is the disadvantage of Pipelining ?

(A) Instruction Latency is higher

(B) Cycle time is less

(C) Multiple instructions are overlapped

(D) System throughput increases

19. What is the addressing mode of a Machine Language Instruction in which the data for the instruction is given as an operand in the instruction itself ?

(A) Immediate addressing

(B) Register addressing

(C) Direct addressing

(D) Indirect addressing

20. Assume that the binary equivalent of integer value 375 is stored in a 16-bit Shift-Left register. What will be the value (in hexadecimal) in the register after the Shift-Left operation is carried out on it twice ?

(A) 02EE

(B) 05DC

(C) 0177

(D) 04BA

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

```
int main ()
{
   int i, k = 0;
   float c [100];
   for (i = 0; i < 10; i + = 3)
      if (&c [i + 20] – &c [i + 16])
        k + = &c [i + 3] – &c [i];
    else k++;
   printf ("k = %d", k);
}
```

(A) 12

(B) 30

(C) 48

(D) Compiler Error

22. Consider the following code segment :

```
int mult (int x, int n)
{
    int val = 1;
    if (n > 0)
    {
        if (n%2 = = 1) val = val * x;
        val = val * mult (x*x, n/2);
    }
    return val;
}
```

What value is returned for mult (3, 6) ?

(A) 729 (B) 216

(C) 243 (D) 108

23. Consider the following program :

```
#include <stdio.h>
main ()
{
        int a = 3, b = 5, c, d ;
        c = a++, ++a;
        d = (b++, ++b);
        printf("a = %d b = %d c = %d d = %d", a, b, c, d);
}
```

The output of this program is

(A) a = 4 b = 6 c = 4 d = 6

(B) a = 5 b = 7 c = 3 d = 7

(C) a = 5 b = 7 c = 4 d = 6

(D) Syntax Error

24. In C++, the address of the object

(A) cannot be accessed from inside the member function.

(B) cannot be accessed in the program.

(C) is available inside the member function using the *this* pointer.

(D) can be accessed using the object name inside the member function.

25. Which of the following are true about constructors in C++ ?

I. They cannot be virtual.

II. They cannot be private.

III. They are automatically called by the *new* operator.

IV. They have no return type.

V. The maximum number of constructors that a class can have is 64.

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

26. Which of the following is false ?

(A) A point (x, y) in 2D can have an infinite number of homogenous coordinates.

(B) Homogeneous coordinates can be used to represent point at infinity.

(C) With homogeneous coordinates, we can represent 2D affine transformations as 3D linear transformations.

(D) Homogeneous coordinates consume less memory than Cartesian coordinates.

27. Which of the following point will not be part of line plotted between the points (20, 10) and (30, 18) using Bresenham Line Drawing Algorithm ?

(A) (23, 12) (B) (25, 15)

(C) (27, 16) (D) (28, 16)

28. Reflection of a point about x-axis, followed by a counter-clockwise rotation of 90 degrees, is equivalent to reflection about the line

(A) $x = -y$

(B) $x = 0$

(C) $x = y$

(D) $x + y = 1$

29. In the Cohen Sutherland line clipping algorithm, if the codes of the four points P, Q, R and S are 1001, 0101, 0010 and 1010 respectively, then which of the following line segments is lying partially inside the clipping window ?

(A) PQ (B) PR (C) PS (D) RS

30. Perspective projection is classified on the basis of

(A) Vanishing points

(B) View plane

(C) Direction of projection

(D) Centre of projection

31. Consider the following statements about Data Models in DBMS :

i. Data is represented in form of entities, relations, objects or similar other ways by Data models.

ii. Data Model is used to store, manipulate and retrieve the data.

iii. Data Model doesn't represent data semantics.

iv. Data Model describes consistency constraints.

Which pair of statements from the above are true ?

(A) i and iii (B) i and iv

(C) ii and iii (D) ii and iv

32. Consider the relation *STUD (sid, sname, city)*. Assume that one of the values of *sid* is *"S1"*. Which one from the following queries will find students who belong to the same city as that of student with sid *"S1"* ?

(A) SELECT sname from STUD where city = "S1";

(B) SELECT sname from STUD where city LIKE "S1";

(C) SELECT sname from STUD where city = (SELECT city from STUD where sid = "S1");

(D) SELECT sname from STUD where city = (SELECT city from STUD where sid LIKE "S1");

33. If all non-key attributes of a relation are fully functionally dependent on primary attributes only, then the relation satisfies which of the following Normal Form ?

(A) 5^{th} (B) 3^{rd}

(C) 4^{th} (D) 2^{nd}

34. Which types of databases allow time-based reasoning ?

(A) Deductive database

(B) Temporal database

(C) Semistructured database

(D) Both (A) and (B)

35. An employee is allowed to work in several departments and a department is allowed to have several employees is an example of

(A) one-to-one relationship

(B) one-to-many relationship

(C) many-to-many relationship

(D) many-to-one relationship

36. Which operator preserves unmatched rows of the relations being joined ?

(A) Union

(B) Inner Join

(C) Outer Join

(D) Union Join

37. Which one of the following constraints does not enforce uniqueness but enforce data integrity ?

(A) UNIQUE

(B) Primary Key

(C) Super Key

(D) Foreign Key

38. Which of the following relational algebra operations is not commutative ?

(A) Projection

(B) Selection

(C) Union

(D) Intersection

39. Consider the join of a relation R with relation S. If R has m tuples and S has n tuples, then the maximum size of join is

(A) $m + n$

(B) $2(m + n)$

(C) mn

(D) $2m + n$

40. Suppose you would like to use supervised learning to predict the price of a car based on an existing dataset for several cars. This is an example of

(A) Classification

(B) Regression

(C) Clustering

(D) Structural Equation Modelling

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 generate Object Code which further requires linking, hence require more memory.

(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 P_0 and P_1 ?

```
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 = 1;                P1_g : turn = 0;
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 : P_0 should set flag [1] = true and P_1 should set flag [0] = true

(B) Line 4 : P_0 should set turn = 0 and P_1 should set turn = 1

(C) Line 6 : P_0 should check turn = = 0 and P_1 should check turn = = 1

(D) There is nothing wrong with the above code

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

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

(B) Mutual Exclusion, Hold and Wait, No preemption, Bounded Waiting

(C) Critical Section, Hold and Wait, Preemption, Bounded Waiting

(D) Mutual Exclusion, Starvation, No preemption, Circular wait

44. Consider the arrival times and burst times of P1 – P4 :

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

What will be the order of completion based on preemptive shortest-remaining-time-first policy ?

(A) P1, P2, P4, P3

(B) P2, P4, P1, P3

(C) P3, P1, P2, P4

(D) P2, P1, P3, P4

45. Consider a serial program in two parts A and B for which the time taken by A, $T_A = 4s$ 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) 1.25

(B) 1.66

(C) 1.19

(D) 2.77

46. Which of the following statements is (are) true regarding RAID ?

I. Disk striping is done to ensure continuous availability.

II. Disk mirroring cannot be used for increasing throughput.

III. Parity data is used by RAID to achieve redundancy.

(A) II only

(B) I and II

(C) I and III

(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 linked list method, free disk blocks can be found quickly.

III. In Bit map, it is easy to get contiguous files.

(A) II 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 can extend the kernel functionality at runtime.

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

(A) I only

(B) I and II

(C) I and III

(D) II and III

49. Interprocess communication in Linux does not happen via

(A) Signals

(B) Mailslots

(C) Semaphores

(D) Pipes

50. Which of the following is/are true regarding a Unix File System (UFS) ?

I. A super block contains the metadata for files such as ownership, type, and access.

II. The boot block is located in the first few sectors of a file system.

III. Each data block contains a magic number.

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

51. Consider the statements of the user requirement : The system shall not accept passwords longer than 15 characters. If the user enters more than 15 characters while choosing the password, an error message shall ask the user to correct it. The requirement is

(A) Incomplete

(B) Inconsistent

(C) Repetitive

(D) Unambiguous

52. An exception handler that closes all open files, creates an error log, notifies user etc. If such functionalities are implemented using object-oriented approach the developer will take care of utilizing which cohesion ?

(A) Functional

(B) Temporal

(C) Communicational

(D) Layer