D	8	7	1	5

PAPER - II
COMPUTER SCIENCE

Time : 1¼ hours]

[Maximum Marks : 100

Number of Pages in this Booklet : **12**

Number of Questions in this Booklet : **50**

Instructions for the Candidates	**परीक्षार्थियों के लिए निर्देश**
1. Write your roll number in the space provided on the top of this page.	1. इस पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए।
2. This paper consists of fifty multiple-choice type of questions.	2. इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं।
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 :	3. परीक्षा प्रारम्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी। पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निम्नलिखित जाँच के लिए दिये जायेंगे, जिसकी जाँच आपको अवश्य करनी है :
(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.	(i) प्रश्न-पुस्तिका खोलने के लिए पुस्तिका पर लगी कागज की सील को फाड़ लें। खुली हुई या बिना स्टीकर-सील की पुस्तिका स्वीकार न करें।
(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.**	(ii) **कवर पृष्ठ पर छपे निर्देशानुसार प्रश्न-पुस्तिका के पृष्ठ तथा प्रश्नों की संख्या को अच्छी तरह चैक कर लें कि ये पूरे हैं। दोषपूर्ण पुस्तिका जिनमें पृष्ठ/प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात किसी भी प्रकार की त्रुटिपूर्ण पुस्तिका स्वीकार न करें तथा उसी समय उसे लौटाकर उसके स्थान पर दूसरी सही प्रश्न-पुस्तिका ले लें। इसके लिए आपको पाँच मिनट दिये जायेंगे। उसके बाद न तो आपकी प्रश्न-पुस्तिका वापस ली जायेगी और न ही आपको अतिरिक्त समय दिया जायेगा।**
(iii) After this verification is over, the Test Booklet Number should be entered on the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.	(iii) इस जाँच के बाद प्रश्न-पुस्तिका का नंबर OMR पत्रक पर अंकित करें और OMR पत्रक का नंबर इस प्रश्न-पुस्तिका पर अंकित कर दें।
4. Each item has four alternative responses marked (1), (2), (3) and (4). You have to darken the circle as indicated below on the correct response against each item.	4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (1), (2), (3) तथा (4) दिये गये हैं। आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है।
Example : ① ② ● ④ where (3) is the correct response.	**उदाहरण :** ① ② ● ④ जबकि (3) सही उत्तर है।
5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only.** If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.	5. प्रश्नों के उत्तर **केवल प्रश्न पुस्तिका के अन्दर दिये गये OMR पत्रक पर ही** अंकित करने हैं। यदि आप OMR पत्रक पर दिये गये वृत्त के अलावा किसी अन्य स्थान पर उत्तर चिन्हांकित करते हैं, तो उसका मूल्यांकन नहीं होगा।
6. Read instructions given inside carefully.	6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें।
7. Rough Work is to be done in the end of this booklet.	7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें।
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR 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. यदि आप OMR पत्रक पर नियत स्थान के अलावा अपना नाम, रोल नम्बर, फोन नम्बर या कोई भी ऐसा चिह्न जिससे आपकी पहचान हो सके, अंकित करते हैं अथवा अभद्र भाषा का प्रयोग करते हैं, या कोई अन्य अनुचित साधन का प्रयोग करते हैं, जैसे कि अंकित किये गये उत्तर को मिटाना या सफेद स्याही से बदलना तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं।
9. You have to return the original OMR Sheet to the invigilators 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 Sheet on conclusion of examination.	9. आपको परीक्षा समाप्त होने पर मूल OMR पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें। हालांकि आप परीक्षा समाप्ति पर मूल प्रश्न-पुस्तिका तथा OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं।
10. **Use only Blue/Black Ball point pen.**	10. केवल नीले/काले बाल प्वाईंट पेन का ही इस्तेमाल करें।
11. **Use of any calculator or log table etc., is prohibited.**	11. किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है।
12. **There are no negative marks for incorrect answers.**	12. गलत उत्तरों के लिए कोई नकारात्मक अंक नहीं हैं।

Note : This paper contains **fifty (50)** objective type questions of **two (2)** marks each. **All** questions are **compulsory**. Choose the most appropriate option.

1. How many committees of five people can be chosen from 20 men and 12 women such that each committee contains atleast three women ?

(1) 75240   (2) 52492   (3) 41800   (4) 9900

2. Which of the following statement(s) is/are **false** ?

(a) A connected multigraph has an Euler Circuit if and only if each of its vertices has even degree.

(b) A connected multigraph has an Euler Path but not an Euler Circuit if and only if it has exactly two vertices of odd degree.

(c) A complete graph (K_n) has a Hamilton Circuit whenever $n \geqslant 3$.

(d) A cycle over six vertices (C_6) is not a bipartite graph but a complete graph over 3 vertices is bipartite.

Codes :

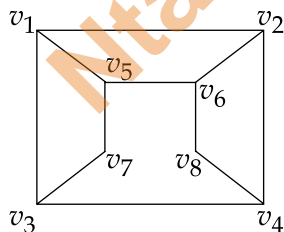(1) (a) only   (2) (b) and (c)   (3) (c) only   (4) (d) only

3. Which of the following is/are **not true** ?

(a) The set of negative integers is countable.

(b) The set of integers that are multiples of 7 is countable.

(c) The set of even integers is countable.

(d) The set of real numbers between 0 and ½ is countable.

Codes :

(1) (a) and (c)   (2) (b) and (d)   (3) (b) only   (4) (d) only

4. Consider the graph given below :

The two distinct sets of vertices, which make the graph bipartite are :

(1) $(v_1, v_4, v_6); (v_2, v_3, v_5, v_7, v_8)$ (2) $(v_1, v_7, v_8); (v_2, v_3, v_5, v_6)$

(3) $(v_1, v_4, v_6, v_7); (v_2, v_3, v_5, v_8)$ (4) $(v_1, v_4, v_6, v_7, v_8); (v_2, v_3, v_5)$

5. A tree with n vertices is called graceful, if its vertices can be labelled with integers 1, 2,....n such that the absolute value of the difference of the labels of adjacent vertices are all different. Which of the following trees are graceful ?

(a)

(b)

(c)
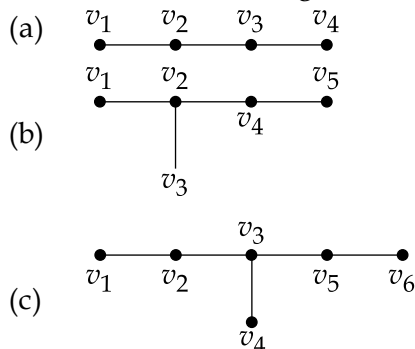
Codes :

(1) (a) and (b) (2) (b) and (c) (3) (a) and (c) (4) (a), (b) and (c)

6. Which of the following arguments are **not** valid ?
   (a) " If Gora gets the job and works hard, then he will be promoted. If Gora gets promotion, then he will be happy. He will not be happy, therefore, either he will not get the job or he will not work hard".
   (b) "Either Puneet is not guilty or Pankaj is telling the truth. Pankaj is not telling the truth, therefore, Puneet is not guilty".
   (c) If n is a real number such that $n>1$, then $n^2>1$. Suppose that $n^2>1$, then $n>1$.

   Codes :
   (1) (a) and (c) (2) (b) and (c) (3) (a), (b) and (c) (4) (a) and (b)

7. Let P(m, n) be the statement "m divides n" where the Universe of discourse for both the variables is the set of positive integers. Determine the truth values of the following propositions.

   (a) $\exists m \ \forall n \ P(m, n)$ (b) $\forall n \ P(1, n)$ (c) $\forall m \ \forall n \ P(m, n)$

   Codes :
   (1) (a) - True; (b) - True; (c) - False (2) (a) - True; (b) - False; (c) - False
   (3) (a) - False; (b) - False; (c) - False (4) (a) - True; (b) - True; (c) - True

8. Match the following terms :

	List - I		**List - II**
(a)	Vacuous proof	(i)	A proof that the implication $p \rightarrow q$ is true based on the fact that p is false.
(b)	Trivial proof	(ii)	A proof that the implication $p \rightarrow q$ is true based on the fact that q is true.
(c)	Direct proof	(iii)	A proof that the implication $p \rightarrow q$ is true that proceeds by showing that q must be true when p is true.
(d)	Indirect proof	(iv)	A proof that the implication $p \rightarrow q$ is true that proceeds by showing that p must be false when q is false.

   Codes :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iii)	(i)	(iv)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(iv)	(iii)	(ii)	(i)

9. Consider the compound propositions given below as :

   (a) $p \vee \smallfrown (p \wedge q)$ (b) $(p \wedge \smallfrown q) \vee \smallfrown (p \wedge q)$

   (c) $p \wedge (q \vee r)$

   Which of the above propositions are tautologies ?

   (1)   (a) and (c)   (2)   (b) and (c)   (3)   (a) and (b)   (4)   (a), (b) and (c)

10. Which of the following property/ies a Group G must hold, in order to be an Abelian group ?

    (a)   The distributive property

    (b)   The commutative property

    (c)   The symmetric property

    Codes :

    (1)   (a) and (b)   (2)   (b) and (c)   (3)   (a) only   (4)   (b) only

11. Consider the following program :

```
#include<stdio.h>
main( )
{
      int i, inp;
      float x, term=1, sum=0;
      scanf("%d %f ", & inp, &x);
      for(i=1; i<=inp; i++)
      {
            term = term * x/i;
            sum = sum + term ;
      }
      printf("Result = %f\n", sum);
}
```

    The program computes the sum of which of the following series ?

    (1) $x + x^2/2 + x^3/3 + x^4/4 + ...$ (2) $x + x^2/2! + x^3/3! + x^4/4! + ...$

    (3) $1 + x^2/2 + x^3/3 + x^4/4 + ...$ (4) $1 + x^2/2! + x^3/3! + x^4/4! + ...$

12. Consider the following **two** statements :

    (a)   A publicly derived class is a subtype of its base class.

    (b)   Inheritance provides for code reuse.

    Which one of the following statements is **correct** ?

    (1)   Both the statements (a) and (b) are correct.

    (2)   Neither of the statements (a) and (b) are correct.

    (3)   Statement (a) is correct and (b) is incorrect.

    (4)   Statement (a) is incorrect and (b) is correct.

13. Consider a "CUSTOMERS" database table having a column "CITY" filled with all the names of Indian cities (in capital letters). The SQL statement that finds all cities that have "GAR" somewhere in its name, is :

(1) Select * from customers where

city = '%GAR%';

(2) Select * from customers where

city = 'GAR';

(3) Select * from customers where

city like '%GAR%';

(4) Select * from customers where

city as '%GAR';

14. Match the following database terms to their functions :

	List - I		List - II
(a)	Normalization	(i)	Enforces match of primary key to foreign key
(b)	Data Dictionary	(ii)	Reduces data redundancy in a database
(c)	Referential Integrity	(iii)	Defines view(s) of the database for particular user(s)
(d)	External Schema	(iv)	Contains metadata describing database structure

Codes :

	(a)	(b)	(c)	(d)
(1)	(iv)	(iii)	(i)	(ii)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

15. In general, in a recursive and non-recursive implementation of a problem (program) :

(1) Both time and space complexities are better in recursive than in non-recursive program.

(2) Both time and space complexities are better in non-recursive than in recursive program.

(3) Time complexity is better in recursive version but space complexity is better in non-recursive version of the program.

(4) Space complexity is better in recursive version but time complexity is better in non-recursive version of the program.

16. A three dimensional array in 'C' is declared as int A[x][y][z]. Here, the address of an item at the location A[p][q][r] can be computed as follows (where w is the word length of an integer) :

(1) &A[0][0][0] + w(y*z*q + z*p + r)

(2) &A[0][0][0] + w(y*z*p + z*q + r)

(3) &A[0][0][0] + w(x*y*p + z*q + r)

(4) &A[0][0][0] + w(x*y*q + z*p + r)

17. In C++, which system - provided function is called when no handler is provided to deal with an exception ?

(1) terminate ( )   (2) unexpected ( )   (3) abort ( )   (4) kill ( )

18. Which of the following provides the best description of an entity type ?

(1) A specific concrete object with a defined set of processes (e.g. Jatin with diabetes)

(2) A value given to a particular attribute (e.g. height - 230 cm)

(3) A thing that we wish to collect data about zero or more, possibly real world examples of it may exist

(4) A template for a group of things with the same set of characteristics that may exist in the real world

19. Data which improves the performance and accessibility of the database are called :

(1) Indexes   (2) User Data

(3) Application Metadata   (4) Data Dictionary

20. A relation R = {A, B, C, D, E, F,G} is given with following set of functional dependencies :

$F = \{AD \rightarrow E, BE \rightarrow F, B \rightarrow C, AF \rightarrow G\}$

Which of the following is a candidate key ?

(1) A   (2) AB   (3) ABC   (4) ABD

21. Which of the following services is **not** provided by wireless access point in 802.11 WLAN ?

(1) Association   (2) Disassociation   (3) Error correction   (4) Integration

22. Which of the following fields in IPv 4 datagram is **not** related to fragmentation ?

(1) Type of service   (2) Fragment offset   (3) Flags   (4) Identification

23. Four channels are multiplexed using TDM. If each channel sends 100 bytes/second and we multiplex 1 byte per channel, then the bit rate for the link is _____.

(1) 400 bps   (2) 800 bps   (3) 1600 bps   (4) 3200 bps

24. In a typical mobile phone system with hexagonal cells, it is forbidden to reuse a frequency band in adjacent cells. If 840 frequencies are available, how many can be used in a given cell ?

(1) 280   (2) 210   (3) 140   (4) 120

25. Using p = 3, q = 13, d = 7 and e = 3 in the RSA algorithm, what is the value of ciphertext for a plain text 5 ?

(1) 13   (2) 21   (3) 26   (4) 33

26. A virtual memory has a page size of 1K words. There are eight pages and four blocks. The associative memory page table contains the following entries :

Page	Block
0	3
2	1
5	2
7	0

Which of the following list of virtual addresses (in decimal) will **not** cause any page fault if referenced by the CPU ?

(1) 1024, 3072, 4096, 6144   (2) 1234, 4012, 5000, 6200

(3) 1020, 3012, 6120, 8100   (4) 2021, 4050, 5112, 7100

27. Suppose that the number of instructions executed between page fault is directly proportional to the number of page frames allocated to a program. If the available memory is doubled, the mean interval between page faults is also doubled. Further, consider that a normal instruction takes one microsecond, but if a page fault occurs, it takes 2001 microseconds. If a program takes 60 sec to run, during which time it gets 15,000 page faults, how long would it take to run if twice as much memory were available ?

(1) 60 sec   (2) 30 sec   (3) 45 sec   (4) 10 sec

28. Consider a disk with 16384 bytes per track having a rotation time of 16 msec and average seek time of 40 msec. What is the time in msec to read a block of 1024 bytes from this disk ?

(1) 57 msec   (2) 49 msec   (3) 48 msec   (4) 17 msec

29. A system has four processes and five allocatable resources. The current allocation and maximum needs are as follows :

	Allocated	Maximum	Available
Process **A**	1 0 2 1 1	1 1 2 1 3	0 0 x 1 1
Process **B**	2 0 1 1 0	2 2 2 1 0	
Process **C**	1 1 0 1 0	2 1 3 1 0	
Process **D**	1 1 1 1 0	1 1 2 2 1	

The smallest value of x for which the above system in safe state is _____.

(1) 1 (2) 3 (3) 2 (4) 0

30. In Unix, the login prompt can be changed by changing the contents of the file _____.

(1) contrab (2) init (3) gettydefs (4) inittab

31. A data cube C, has n dimensions, and each dimension has exactly p distinct values in the base cuboid. Assume that there are no concept hierarchies associated with the dimensions. What is the maximum number of cells possible in the data cube, C ?

(1) p^n (2) p (3) $(2^n-1)\,p+1$ (4) $(p+1)^n$

32. Suppose that from given statistics, it is known that meningitis causes stiff neck 50% of the time, that the proportion of persons having meningitis is $\dfrac{1}{50000}$, and that the proportion of people having stiff neck is $\dfrac{1}{20}$. Then the percentage of people who had meningitis and complain about stiff neck is :

(1) 0.01% (2) 0.02% (3) 0.04% (4) 0.05%

33. _____ system is market oriented and is used for data analysis by knowledge workers including Managers, Executives and Analysts.

(1) OLTP (2) OLAP (3) Data System (4) Market System

34. _____ allows selection of the relevant information necessary for the data warehouse.

(1) The Top - Down View (2) Data Warehouse View
(3) Datasource View (4) Business Query View

35. The hash function used in double hashing is of the form :

(1) $h(k, i) = (h_1(k) + h_2(k) + i) \bmod m$ (2) $h(k, i) = (h_1(k) + h_2(k) - i) \bmod m$
(3) $h(k, i) = (h_1(k) + i\,h_2(k)) \bmod m$ (4) $h(k, i) = (h_1(k) - i\,h_2(k)) \bmod m$

36. In the following graph, discovery time stamps and finishing time stamps of Depth First Search (DFS) are shown as x/y, where x is discovery time stamp and y is finishing time stamp.

13/14   11/16   1/10   8/9

(a) → (b) → (c) ⇄ (d)

(e) → (f) ⇄ (g) → (h)

12/15   3/4   2/7   5/6
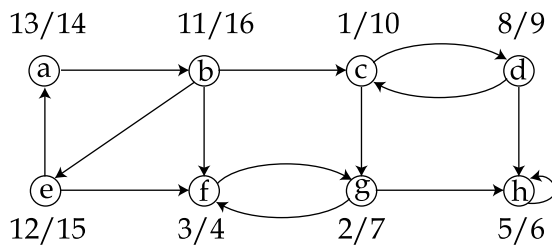
It shows which of the following depth first forest ?

(1) {a, b, e} {c, d, f, g, h}   (2) {a, b, e} {c, d, h} {f, g}

(3) {a, b, e} {f, g} {c, d} {h}   (4) {a, b, c, d} {e, f, g} {h}

37. The number of disk pages access in B - tree search, where h is height, n is the number of keys, and t is the minimum degree, is :

(1) $\theta(\log_n h*t)$ (2) $\theta(\log_t n*h)$ (3) $\theta(\log_h n)$ (4) $\theta(\log_t n)$

38. The inorder traversal of the following tree is :

```
            (15)
          /      \
       (13)       (20)
       /   \      /   \
    (4)    (7)  (17)  (18)
    / \     |     |
  (2) (3)  (6)  (18)
```
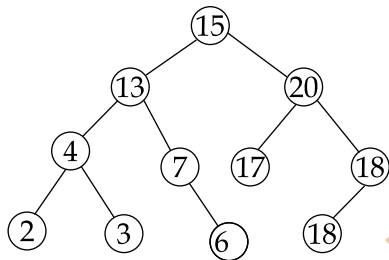
(1) 2   3   4   6   7   13   15   17   18   18   20

(2) 20   18   18   17   15   13   7   6   4   3   2

(3) 15   13   20   4   7   17   18   2   3   6   18

(4) 2   4   3   13   7   6   15   17   20   18   18

39. An ideal sort is an in-place-sort whose additional space requirement is _____.

(1) $O(\log_2 n)$ (2) $O(n\log_2 n)$ (3) $O(1)$ (4) $O(n)$

40. Which of the following is **not** a congestion policy at network layer ?

(1) Flow Control Policy

(2) Packet Discard Policy

(3) Packet Lifetime Management Policy

(4) Routing Algorithm

41. Loop unrolling is a code optimization technique :

(1) that avoids tests at every iteration of the loop.

(2) that improves performance by decreasing the number of instructions in a basic block.

(3) that exchanges inner loops with outer loops.

(4) that reorders operations to allow multiple computations to happen in parallel.

42. What will be the hexadecimal value in the register ax (32-bit) after executing the following instructions ?

       mov al, 15

       mov ah, 15

       $x$or al, al

       mov cl, 3

       shr ax, cl

Codes :

(1) 0F00 h   (2) 0F0F h   (3) 01E0 h   (4) FFFF h

43. Which of the following statements is **false** ?

(1) Top-down parsers are LL parsers where first L stands for left - to - right scan and second L stands for a leftmost derivation.

(2) (000)* is a regular expression that matches only strings containing an odd number of zeroes, including the empty string.

(3) Bottom-up parsers are in the LR family, where L stands for left - to - right scan and R stands for rightmost derivation.

(4) The class of context - free languages is closed under reversal. That is, if L is any context - free language, then the language $L^R = \{w^R: w \epsilon L\}$ is context - free.

44. System calls are usually invoked by using :

(1) A privileged instruction   (2) An indirect jump

(3) A software interrupt   (4) Polling

45. The _____ transfers the executable image of a C++ program from hard disk to main memory.

(1) Compiler   (2) Linker   (3) Debugger   (4) Loader

46. In software testing, how the error, fault and failure are related to each other ?

(1) Error leads to failure but fault is not related to error and failure.

(2) Fault leads to failure but error is not related to fault and failure.

(3) Error leads to fault and fault leads to failure.

(4) Fault leads to error and error leads to failure.

47. Which of the following is **not** a software process model ?

(1) Prototyping   (2) Iterative   (3) Timeboxing   (4) Glassboxing

48. How many solutions are there for the equation $x + y + z + u = 29$ subject to the constraints that $x \geq 1$, $y \geq 2$, $z \geq 3$ and $u \geq 0$?

(1) 4960   (2) 2600   (3) 23751   (4) 8855

49. A unix file system has 1-KB blocks and 4-byte disk addresses. What is the maximum file size if i-nodes contain 10 direct entries and one single, double and triple indirect entry each ?

(1) 32 GB   (2) 64 GB   (3) 16 GB   (4) 1 GB

50. _____ uses electronic means to transfer funds directly from one account to another rather than by cheque or cash.

(1) M-Banking   (2) E-Banking   (3) O-Banking   (4) C-Banking

- o 0 o -

Space For Rough Work