Signature and Name of Invigilator

1. (Signature) _____

   (Name) _____

2. (Signature) _____

   (Name) _____

OMR Sheet No. : .....
(To be filled by the Candidate)

Roll No. | | | | | | | | | |
(In figures as per admission card)

N 0 8 7 1 7

PAPER - II COMPUTER SCIENCE AND APPLICATIONS

Roll No. _____
(In words)

Time : 1¼ hours] **[Maximum Marks : 100**

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

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

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of fifty multiple-choice type of questions.
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 Sheet and the OMR Sheet Number should be entered on this Test Booklet.
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.
   Example : ① ② ● ④ where (3) is the correct response.
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.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
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.
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.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There are no negative marks for incorrect answers.**

परीक्षार्थियों के लिए निर्देश

1. इस पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए।
2. इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं।
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) 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) **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 अर्थात् 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) 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. 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।
   उदाहरण : ① ② ● ④ जबकि (3) सही उत्तर है।
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 चिह्नांकित करते हैं, तो उसका मूल्यांकन नहीं होगा।
6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें।
7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें।
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. 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. **केवल नीले/काले बाल प्वाईंट पेन का ही प्रयोग करें।**
11. **किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है।**
12. **गलत उत्तरों के लिए कोई नकारात्मक अंक नहीं हैं।**

COMPUTER SCIENCE AND APPLICATIONS

PAPER - II

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

1. If the time is now 4 O'clock, what will be the time after 101 hours from now ?

(1) 9 O'clock (2) 8 O'clock (3) 5 O'clock (4) 4 O'clock

2. Let $m = (313)_4$ and $n = (322)_4$. Find the base 4 expansion of $m + n$.

(1) $(635)_4$ (2) $(32312)_4$ (3) $(21323)_4$ (4) $(1301)_4$

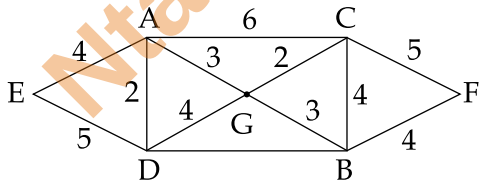
3. Let $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ Find the boolean product $A \odot B$ of the two matrices.

(1) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (2) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (3) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (4) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

4. How many distinguishable permutations of the letters in the word BANANA are there ?

(1) 720 (2) 120 (3) 60 (4) 360

5. Consider the graph given below :



Use Kruskal's algorithm to find a minimal spanning tree for the graph. The List of the edges of the tree in the order in which they are choosen is ?

(1) AD, AE, AG, GC, GB, BF (2) GC, GB, BF, GA, AD, AE

(3) GC, AD, GB, GA, BF, AE (4) AD, AG, GC, AE, GB, BF

6. The Boolean function with the Karnaugh map

CD \ AB	00	01	11	10
00	0	1	1	0
01	0	1	1	1
11	1	1	1	1
10	0	1	1	0

is :

(1) $(A+C).D+B$ (2) $(A+B).C+D$

(3) $(A+D).C+B$ (4) $(A+C).B+D$

7. The Octal equivalent of the binary number 1011101011 is :

(1) 7353 (2) 1353 (3) 5651 (4) 5657

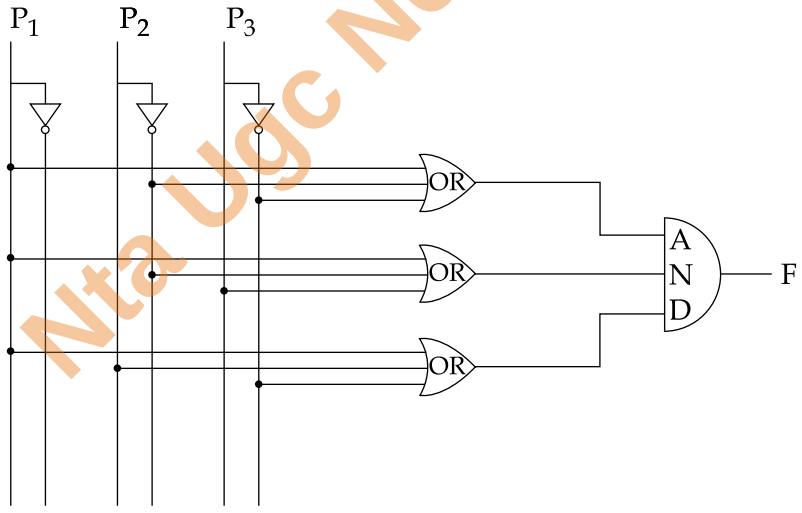
8. Let P and Q be two propositions, $\neg (P \leftrightarrow Q)$ is equivalent to :

(1) $P \leftrightarrow \neg Q$ (2) $\neg P \leftrightarrow Q$ (3) $\neg P \leftrightarrow \neg Q$ (4) $Q \rightarrow P$

9. Negation of the proposition $\exists\, x\, H(x)$ is :

(1) $\exists\, x \neg H(x)$ (2) $\forall\, x \neg H(x)$ (3) $\forall\, x\, H(x)$ (4) $\neg\, x\, H(x)$

10. The output of the following combinational circuit is F.



The value of F is :

(1) $P_1+P_2'P_3$ (2) $P_1+P_2'P_3'$ (3) $P_1+P_2P_3'$ (4) $P_1'+P_2P_3$

11. 'ptrdata' is a pointer to a data type. The expression *ptrdata++ is evaluated as (in C++) :

(1) *(ptrdata++) (2) (*ptrdata)++

(3) *(ptrdata)++ (4) Depends on compiler

12. The associativity of which of the following operators is Left to Right, in C++ ?

(1) Unary Operator (2) Logical not

(3) Array element access (4) addressof

13. A member function can always access the data in _____ , (in C++).

(1) the class of which it is member (2) the object of which it is a member

(3) the public part of its class (4) the private part of its class

14. Which of the following is **not** correct for virtual function in C++ ?

(1) Must be declared in public section of class.

(2) Virtual function can be static.

(3) Virtual function should be accessed using pointers.

(4) Virtual function is defined in base class.

15. Which of the following is **not** correct (in C++) ?

(1) Class templates and function templates are instantiated in the same way.

(2) Class templates differ from function templates in the way they are initiated.

(3) Class template is initiated by defining an object using the template argument.

(4) Class templates are generally used for storage classes.

16. Which of the following is/are **true** with reference to 'view' in DBMS ?

(a) A 'view' is a special stored procedure executed when certain event occurs.

(b) A 'view' is a virtual table, which occurs after executing a pre-compiled query.

Code :

(1) Only (a) is true (2) Only (b) is true

(3) Both (a) and (b) are true (4) Neither (a) nor (b) are true

17. In SQL, _____ is an Aggregate function.

(1) SELECT (2) CREATE (3) AVG (4) MODIFY

18. Match the following with respect to RDBMS :

(a)	Entity integrity	(i)	enforces some specific business rule that do not fall into entity or domain
(b)	Domain integrity	(ii)	Rows can't be deleted which are used by other records
(c)	Referential integrity	(iii)	enforces valid entries for a column
(d)	Userdefined integrity	(iv)	No duplicate rows in a table

Code :

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

19. In RDBMS, different classes of relations are created using _____ technique to prevent modification anomalies.

(1) Functional Dependencies (2) Data integrity
(3) Referential integrity (4) Normal Forms

20. _____ SQL command changes one or more fields in a record.

(1) LOOK-UP (2) INSERT (3) MODIFY (4) CHANGE

21. Consider an array representation of an n element binary heap where the elements are stored from index 1 to index n of the array. For the element stored at index i of the array (i<=n), the index of the parent is :

(1) floor ((i+1)/2) (2) ceiling ((i+1)/2)
(3) floor (i/2) (4) ceiling (i/2)

22. The following numbers are inserted into an empty binary search tree in the given order : 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree ?

(1) 3 (2) 4 (3) 5 (4) 6

23. Let G be an undirected connected graph with distinct edge weight. Let E_{max} be the edge with maximum weight and E_{min} the edge with minimum weight. Which of the following statements is false ?

(1) Every minimum spanning tree of G must contain E_{min}.
(2) If E_{max} is in minimum spanning tree, then its removal must disconnect G.
(3) No minimum spanning tree contains E_{max}.
(4) G has a unique minimum spanning tree.

24. A list of n strings, each of length n, is sorted into lexicographic order using merge - sort algorithm. The worst case running time of this computation is :

(1) $O(n \log n)$ (2) $O(n^2 \log n)$ (3) $O(n^2 + \log n)$ (4) $O(n^3)$

25. Postorder traversal of a given binary search tree T produces following sequence of keys :
3, 5, 7, 9, 4, 17, 16, 20, 18, 15, 14
Which one of the following sequences of keys can be the result of an in-order traversal of the tree T ?

(1) 3, 4, 5, 7, 9, 14, 20, 18, 17, 16, 15
(2) 20, 18, 17, 16, 15, 14, 3, 4, 5, 7, 9
(3) 20, 18, 17, 16, 15, 14, 9, 7, 5, 4, 3
(4) 3, 4, 5, 7, 9, 14, 15, 16, 17, 18, 20

26. Which of the following devices takes data sent from one network device and forwards it to the destination node based on MAC address ?

(1) Hub (2) Modem (3) Switch (4) Gateway

27. _____ do not take their decisions on measurements or estimates of the current traffic and topology.

(1) Static algorithms (2) Adaptive algorithms
(3) Non - adaptive algorithms (4) Recursive algorithms

28. The number of bits used for addressing in Gigabit Ethernet is _____.

(1) 32 bits (2) 48 bits (3) 64 bits (4) 128 bits

29. Which of the following layer of OSI Reference model is also called end-to-end layer ?

(1) Network layer (2) Datalink layer (3) Session layer (4) Transport layer

30. The IP address _____ is used by hosts when they are being booted.

(1) 0.0.0.0 (2) 1.0.0.0 (3) 1.1.1.1 (4) 255.255.255.255

31. Consider the following program fragment in assembly language :

```
        mov ax, 0h
        mov cx, 0A h
doloop :
        dec ax
        loop doloop
```

What is the value of ax and cx registers after the completion of the doloop ?

(1) ax = FFF5 h and cx = 0 h (2) ax = FFF6 h and cx = 0 h
(3) ax = FFF7 h and cx = 0A h (4) ax = FFF5 h and cx = 0A h

32. Consider the following assembly program fragment :

```
stc
mov al, 11010110b
mov cl, 2
rcl al, 3
rol al, 4
shr al, cl
mul cl
```

The contents of the destination register ax (in hexadecimal) and the status of Carry Flag (CF) after the execution of above instructions, are :

(1) ax = 003CH; CF = 0 (2) ax = 001EH; CF = 0

(3) ax = 007BH; CF = 1 (4) ax = 00B7H; CF = 1

33. Which of the following regular expressions, each describing a language of binary numbers (MSB to LSB) that represents non-negative decimal values, does **not** include even values ?

(1) $0^*1^+0^*1^*$ (2) $0^*1^*0^+1^*$ (3) $0^*1^*0^*1^+$ (4) $0^+1^*0^*1^*$

Where {+, *} are quantification characters.

34. Which of the following statements is/are TRUE ?

(a) The grammar S $\rightarrow$ SS | a is ambiguous. (Where S is the start symbol)

(b) The grammar S $\rightarrow$ 0S1 | 01S | ϵ is ambiguous. (The special symbol ϵ represents the empty string) (Where S is the start symbol)

(c) The grammar (Where S is the start symbol)

S $\rightarrow$ T/U

T $\rightarrow$ x S y | xy | ϵ

U $\rightarrow$ yT

generates a language consisting of the string $yxxyy$.

(1) Only (a) and (b) are TRUE. (2) Only (a) and (c) are TRUE.

(3) Only (b) and (c) are TRUE. (4) All of (a), (b) and (c) are TRUE.

35. Match the description of several parts of a classic optimizing compiler in **List - I**, with the names of those parts in **List - II** :

	List - I		**List - II**
(a)	A part of a compiler that is responsible for recognizing syntax.	(i)	Optimizer
(b)	A part of a compiler that takes as input a stream of characters and produces as output a stream of words along with their associated syntactic categories.	(ii)	Semantic Analysis
(c)	A part of a compiler that understand the meanings of variable names and other symbols and checks that they are used in ways consistent with their definitions.	(iii)	Parser
(d)	An IR-to-IR transformer that tries to improve the IR program in some way (Intermediate Representation).	(iv)	Scanner

Code :

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

36. In Distributed system, the capacity of a system to adapt the increased service load is called _____ .

(1) Tolerance (2) Scalability (3) Capability (4) Loading

37. In _____ disk scheduling algorithm, the disk head moves from one end to other end of the disk, serving the requests along the way. When the head reaches the other end, it immediately returns to the beginning of the disk without serving any requests on the return trip.

(1) LOOK (2) SCAN (3) C - LOOK (4) C - SCAN

38. Suppose there are six files F1, F2, F3, F4, F5, F6 with corresponding sizes 150 KB, 225 KB, 75 KB, 60 KB, 275 KB and 65 KB respectively. The files are to be stored on a sequential device in such a way that optimizes access time. In what order should the files be stored ?

(1) F5, F2, F1, F3, F6, F4 (2) F4, F6, F3, F1, F2, F5

(3) F1, F2, F3, F4, F5, F6 (4) F6, F5, F4, F3, F2, F1

39. Which module gives control of the CPU to the process selected by the short - term schedular ?

(1) Dispatcher (2) Interrupt (3) Schedular (4) Threading

40. Two atomic operations permissible on Semaphores are _____ and _____.

(1) wait, stop (2) wait, hold (3) hold, signal (4) wait, signal

41. Software does not wear-out in the traditional sense of the term, but software does tend to deteriorate as it evolves, because :

(1) Software suffers from exposure to hostile environments.

(2) Defects are more likely to arise after software has been used often.

(3) Multiple change requests introduce errors in component interactions.

(4) Software spare parts become harder to order.

42. Software re-engineering is concerned with :

(1) Re-constructing the original source code from the existing machine (low - level) code program and modifying it to make it more user - friendly.

(2) Scrapping the source code of a software and re-writing it entirely from scratch.

(3) Re-organising and modifying existing software systems to make them more maintainable.

(4) Translating source code of an existing software to a new machine (low - level) language.

43. Which of the following is **not** a key issue stressed by an agile philosophy of software engineering ?

(1) The importance of self-organizing teams as well as communication and collaboration between team members and customers.

(2) Recognition that change represents opportunity.

(3) Emphasis on rapid delivery of software that satisfies the customer.

(4) Having a separate testing phase after a build phase.

44. What is the normal order of activities in which traditional software testing is organized ?

(a) Integration Testing

(b) System Testing

(c) Unit Testing

(d) Validation Testing

Code :

(1) (c), (a), (b), (d)

(2) (c), (a), (d), (b)

(3) (d), (c), (b), (a)

(4) (b), (d), (a), (c)

45. Which of the following testing techniques ensures that the software product runs correctly after the changes during maintenance ?

(1) Path Testing

(2) Integration Testing

(3) Unit Testing

(4) Regression Testing

46. Which of the following Super Computers is the fastest Super Computer ?

(1) Sun-way TaihuLight

(2) Titan

(3) Piz Daint

(4) Sequoia

47. Which of the following statements about ERP system is **true** ?

(1) Most ERP software implementations fully achieve seamless integration.

(2) ERP software packages are themselves combinations of seperate applications for manufacturing, materials, resource planning, general ledger, human resources, procurement and order entry.

(3) Integration of ERP systems can be achieved in only one way.

(4) An ERP package implemented uniformly throughout an enterprise is likely to contain very flexible connections to allow charges and software variations.

48. Which of the following is **not** a Clustering method ?

(1) K - Mean method (2) Self Organizing feature map method

(3) K - nearest neighbor method (4) Agglomerative method

49. Which of the given wireless technologies used in IoT, consumes the least amount of power ?

(1) Zigbee (2) Bluetooth (3) Wi-Fi (4) GSM/CDMA

50. Which speed up could be achieved according to Amdahl's Law for infinite number of processes if 5% of a program is sequential and the remaining part is ideally parallel ?

(1) Infinite (2) 5 (3) 20 (4) 50

- o 0 o -

Space For Rough Work