PAPER-III
COMPUTER SCIENCE AND APPLICATIONS

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)

Roll No._____

(In words)

J	8	7	1	2

Time : **2 ¹/₂ hours**]

[Maximum Marks : **150**

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

Number of Questions in this Booklet : **75**

Instructions for the Candidates	**परीक्षार्थियों के लिए निर्देश**
1. Write your roll number in the space provided on the top of this page.	1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए ।
2. This paper consists of seventy five multiple-choice type of questions.	2. इस प्रश्न-पत्र में पचहत्तर 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 उसके कवर पेज 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 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) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.	(iii) इस जाँच के बाद OMR पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें ।
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item. **Example :** Ⓐ Ⓑ ● Ⓓ where (C) is the correct response.	4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (A), (B), (C) तथा (D) दिये गये हैं । आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है । **उदाहरण :** Ⓐ Ⓑ ● Ⓓ जबकि (C) 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 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 चिह्नांकित 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, 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, तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं ।
9. You have to return the test question booklet and 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 duplicate copy of OMR Sheet on conclusion of examination.	9. आपको परीक्षा समाप्त होने पर प्रश्न-पुस्तिका एवं 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 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 is no negative marks for incorrect answers.**	12. गलत उत्तरों के लिए कोई अंक काटे नहीं जाएँगे ।

COMPUTER SCIENCE AND APPLICATIONS
Paper – III

Note : This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are compulsory.

1. Consider the following pseudocode segment :

   K:=0
   for i_1:= 1 to n
     for i_2:= 1 to i_1
       :
       :
       :
           for i_m:= 1 to i_{m-1}
             K:= K+1

   The value of K after the execution of this code shall be
   (A) $C(n + m - 1, m)$
   (B) $C(n - m + 1, m)$
   (C) $C(n + m - 1, n)$
   (D) $C(n - m + 1, n)$

2. In Delta Rule for error minimization
   (A) weights are adjusted w.r.to change in the output
   (B) weights are adjusted w.r.to difference between desired output and actual output
   (C) weights are adjusted w.r.to difference between input and output
   (D) none of the above

3. The concept of pipelining is most effective in improving performance if the tasks being performed in different stages :
   (A) require different amount of time
   (B) require about the same amount of time
   (C) require different amount of time with time difference between any two tasks being same
   (D) require different amount with time difference between any two tasks being different

4. What is Granularity ?
   (A) The size of database
   (B) The size of data item
   (C) The size of record
   (D) The size of file

5. Suppose that a given application is run on a 64-processor machine and that 70 percent of the application can be parallelized. Then the expected performance improvement using Amdahl's law is
   (A) 4.22   (B) 3.22
   (C) 3.32   (D) 3.52

6. If two fuzzy sets A and B are given with membership functions
   $\mu_A(x) = \{0.2, 0.4, 0.8, 0.5, 0.1\}$
   $\mu_B(x) = \{0.1, 0.3, 0.6, 0.3, 0.2\}$
   Then the value of $\mu_{\overline{A \cap B}}$ will be
   (A) {0.9, 0.7, 0.4, 0.8, 0.9}
   (B) {0.2, 0.4, 0.8, 0.5, 0.2}
   (C) {0.1, 0.3, 0.6, 0.3, 0.1}
   (D) {0.7, 0.3, 0.4, 0.2, 0.7}

7. Match the following :
   (i) OLAP   (a) Regression
   (ii) OLTP   (b) Data Warehouse
   (iii) Decision   (c) RDBMS
        Tree
   (iv) Neural   (d) Classification
        Network

	(i)	(ii)	(iii)	(iv)
(A)	(b)	(c)	(a)	(d)
(B)	(b)	(c)	(d)	(a)
(C)	(c)	(b)	(a)	(d)
(D)	(c)	(b)	(d)	(a)

18. Consider a schema R(A, B, C, D) and functional dependencies A → B and C → D. Then the decomposition R_1(A, B) and R_2(C, D) is

(A) Dependency preserving but not lossless join

(B) Dependency preserving and lossless join

(C) Lossless Join but not dependency preserving

(D) Lossless Join

19. The quantiser in an image-compression system is a

(A) lossy element which exploits the psychovisual redundancy

(B) lossless element which exploits the psychovisual redundancy

(C) lossy element which exploits the statistical redundancy

(D) lossless element which exploits the statistical redundancy

20. Data Warehouse provides

(A) Transaction Responsiveness

(B) Storage, Functionality Responsiveness to queries

(C) Demand and Supply Responsiveness

(D) None of the above

21. A* algorithm uses f' = g + h' to estimate the cost of getting from the initial state to the goal state, where g is a measure of the cost of getting from initial state to the current node and the function h' is an estimate of the cost of getting from the current node to the goal state. To find a path involving the fewest number of steps, we should set

(A) g = 1   (B) g = 0

(C) h' = 0   (D) h' = 1

22. The transform which possesses the highest 'energy compaction' property is

(A) Slant transform

(B) Cosine transform

(C) Fourier transform

(D) Karhunen-Loeve transform

23. Which one of the following prolog programs correctly implement "if G succeeds then execute goal P else execute goal θ ?"

(A) if-else (G, P, θ) :- !, call(G), call(P).
if-else (G, P, θ) :- call(θ).

(B) if-else (G, P, θ) :- call(G), !, call(P).
if-else (G, P, θ) :- call(θ).

(C) if-else (G, P, θ) :- call(G), call(P), !.
if-else (G, P, θ) :- call(θ).

(D) All of the above

24. The _____ memory allocation function modifies the previous allocated space.

(A) calloc( )   (B) free( )

(C) malloc( )   (D) realloc( )

25. Which is not the correct statement(s) ?

(i) Every context sensitive language is recursive.

(ii) There is a recursive language that is not context sensitive.

(A) (i) is true, (ii) is false.

(B) (i) is true and (ii) is true.

(C) (i) is false, (ii) is false.

(D) (i) is false and (ii) is true.

26. The mechanism that binds code and data together and keeps them secure from outside world is known as

(A) Abstraction

(B) Inheritance

(C) Encapsulation

(D) Polymorphism

36. Number of binary trees formed with 5 nodes are
(A) 32 (B) 36
(C) 120 (D) 42

37. Are we building the right product ? This statement refers to
(A) Verification
(B) Validation
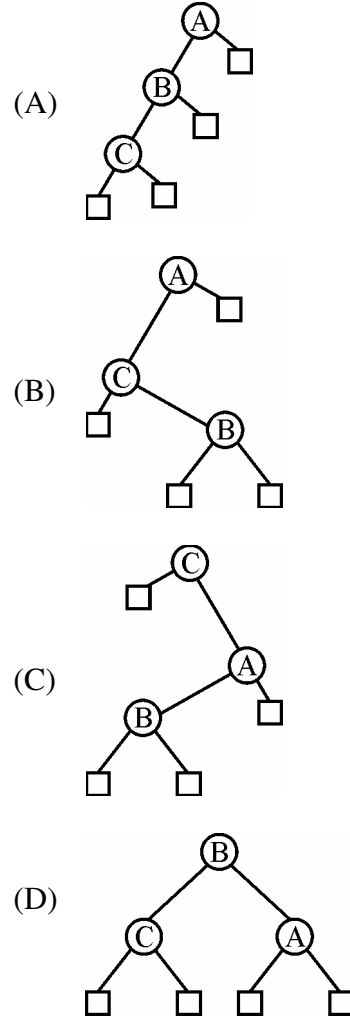(C) Testing
(D) Software quality assurance

38. The following postfix expression is evaluated using a stack
$$823^\wedge/23* + 51* -$$
The top two elements of the stack after first * is evaluated
(A) 6, 1 (B) 5, 7
(C) 3, 2 (D) 1, 5

39. The following CFG
$S \rightarrow aB \mid bA$, $A \rightarrow a \mid as \mid bAA$,
$B \rightarrow b \mid bs \mid aBB$
generates strings of terminals that have
(A) odd number of a's and odd number of b's
(B) even number of a's and even number of b's
(C) equal number of a's and b's
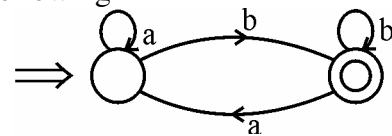(D) not equal number of a's and b's

40. Consider the following pseudo-code :
If (A > B) and (C > D) then
    A = A + 1
    B = B + 1
Endif
The cyclomatic complexity of the pseudo-code is
(A) 2 (B) 3
(C) 4 (D) 5

41. Which layer of OSI reference model uses the ICMP (Internet Control Message Protocol) ?
(A) Transport layer
(B) Data link layer
(C) Network layer
(D) Application layer

42. Which one of the following binary search tree is optimal, if probabilities of successful search and unsuccessful search are same ?
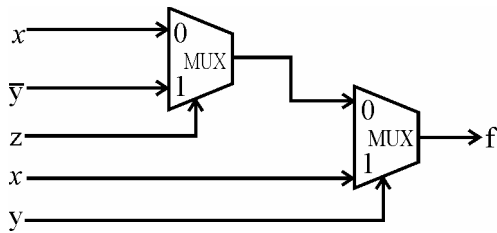
(A)

(B)

(C)

(D)

43. The regular expression for the following DFA

is

(A) ab*(b + aa*b)*

(B) a*b(b + aa*b)*

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

(D) a*b(b * + aa*b)*

53. Consider the below circuit and find the output function f(*x*, y, z).

(A) $x\overline{z} + xy + \overline{y}z$

(B) $x\overline{z} + xy + \overline{y}\,\overline{z}$

(C) $xz + xy + \overline{y}\,\overline{z}$

(D) $xz + x\overline{y} + \overline{y}z$

54. What is the size (in terms of bits) of Header length field in IPV4 header ?

(A) 2   (B) 4

(C) 8   (D) 16

55. Match the following with respect to java.util.∗ class methods :

(a) Bit Set   (i)   Time zone getTimezone( )
(b) Calendar   (ii)   int hashcode( )
(c) Time zone (iii) int nextInt( )
(d) Random   (iv) Void setID(String tzName)

	(a)	(b)	(c)	(d)
(A)	(ii)	(i)	(iv)	(iii)
(B)	(iii)	(iv)	(i)	(ii)
(C)	(iv)	(iii)	(ii)	(i)
(D)	(ii)	(i)	(iii)	(iv)

56. _____ is sometimes said to be object oriented, because the only way to manipulate kernel objects is by invoking methods on their handles.

(A) Windows NT
(B) Windows XP
(C) Windows VISTA
(D) Windows 95/98

57. A user level process in Unix traps the signal sent on a Ctrl + C input and has a signal handling routine that saves appropriate files before terminating the process. When a Ctrl + C input is given to this process, what is the mode in which the signal handling routine executes ?

(A) User mode
(B) Kernel mode
(C) Superuser mode
(D) Privileged mode

58. A CPU generally handles an interrupt by executing an interrupt service routine

(A) as soon as an interrupt is raised
(B) by checking the interrupt register at the end of fetch cycle
(C) by checking the interrupt register after finishing the executing the current instruction
(D) by checking the interrupt register at fixed time intervals

59. The perspective projection matrix, on the view plane z = d where the centre of projection is the origin (0, 0, 0) shall be

(A) $\begin{bmatrix} 0 & 0 & 0 & d \\ 0 & 0 & d & 0 \\ 0 & d & 0 & 0 \\ d & 0 & 0 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} d & 0 & 0 & 0 \\ 0 & d & 0 & 0 \\ 0 & 0 & d & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 0 & 0 & d \\ 0 & 0 & d & 0 \\ 0 & d & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} d & 0 & 0 & 0 \\ 0 & d & 0 & 0 \\ 0 & 0 & d & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

65. Consider the methods used by processes P_1 and P_2 for accessing their critical sections. The initial values of shared Boolean variables S_1 and S_2 are randomly assigned,

$$P_1 \qquad\qquad P_2$$

while $(S_1 == S_2)$; while $(S_1 == S_2)$;

  critical section   critical section

    $S_1 = S_2$; $S_1 = S_2$;

Which one of the following statements describes the properties achieved ?

(A) Mutual exclusion but not progress

(B) Progress but not mutual exclusion

(C) Neither mutual exclusion nor progress

(D) Both mutual exclusion and progress

66. If the period of a signal is 1000 ms, then what is its frequency in kilohertz ?

(A) 10^{-3} KHz   (B) 10^{-2} KHz

(C) 10^{-1} KHz   (D) 1 KHz

67. Let $a * H$ and $b * H$ be two cosets of H.

(i) Either $a * H$ and $b * H$ are disjoint

(ii) $a * H$ and $b * H$ are identical

Then,

(A) only (i) is true

(B) only (ii) is true

(C) (i) or (ii) is true

(D) (i) and (ii) is false

68. HTML is defined using SGML – an _____ standard, information processing-text and office systems (SGML) for text information processing.

(A) ISO – 8878

(B) ISO – 8879

(C) ISO – 8880

(D) ISO – 8881

69. What is the meaning of 'Hibernate' in Windows XP/Windows 7 ?

(A) Restart the computers in safe mode.

(B) Restart the computers in normal mode.

(C) Shutdown the computer terminating all the running applications.

(D) Shutdown the computer without closing the running applications.

70. Assume that we have constructor functions for both base class and derived class. Now consider the declaration in main( ). Base $* P = $ New Derived; in what sequence will the constructor be called ?

(A) Derived class constructor followed by Base class constructor.

(B) Base class constructor followed by derived class constructor.

(C) Base class constructor will not be called.

(D) Derived class constructor will not be called.