PAPER-III
COMPUTER SCIENCE & 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 6

Time : **2 ½** hours] [Maximum Marks : **150**

Number of Pages in this Booklet : **24** | Number of Questions in this Booklet : **75**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of seventy five 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 Black Ball point pen provided by C.B.S.E.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is 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 पचहत्तर 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 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) 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 C.B.S.E. द्वारा प्रदान किये गये काले बाल प्वाईंट पेन का ही इस्तेमाल 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 ।**

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COMPUTER SCIENCE & APPLICATIONS

PAPER – III

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

1. A ripple counter is a (n) :

(1) Synchronous Counter
(2) Asynchronous counter
(3) Parallel counter
(4) None of the above

2. 8085 microprocessor has ____ bit ALU.

(1) 32
(2) 16
(3) 8
(4) 4

3. The register that stores the bits required to mask the interrupts is ______.

(1) Status register
(2) Interrupt service register
(3) Interrupt mask register
(4) Interrupt request register

4. Which of the following in 8085 microprocessor performs

HL = HL + HL ?

(1) DAD D
(2) DAD H
(3) DAD B
(4) DAD SP

5. In ______ addressing mode, the operands are stored in the memory. The address of the corresponding memory location is given in a register which is specified in the instruction.

(1) Register direct
(2) Register indirect
(3) Base indexed
(4) Displacement

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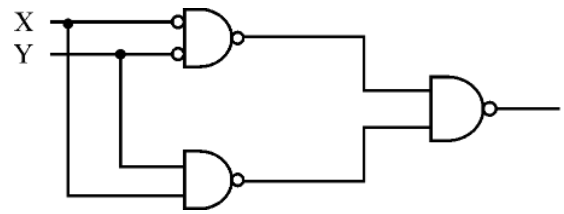
6. The output of the following combinational circuit



is :

(1) X . Y (2) X + Y

(3) $X \oplus Y$ (4) $\overline{X \oplus Y}$

7. Which of the following statements is/are True regarding some advantages that an object-oriented DBMS (OODBMS) offers over a relational database ?

I. An OODBMS avoids the "impedance mismatch" problem.

II. An OODBMS avoids the "phantom" problem.

III. An OODBMS provides higher performance concurrency control than most relational databases.

IV. An OODBMS provides faster access to individual data objects once they have been read from disk.

(1) II and III only (2) I and IV only

(3) I, II, and III only (4) I, III and IV only

8. The Global conceptual Schema in a distributed database contains information about global relations. The condition that all the data of the global relation must be mapped into the fragments, that is, it must not happen that a data item which belongs to a global relation does not belong to any fragment, is called :

(1) Disjointness condition

(2) Completeness condition

(3) Reconstruction condition

(4) Aggregation condition

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9. Suppose database table T1(P, R) currently has tuples {(10, 5), (15, 8), (25, 6)} and table T2 (A, C) currently has {(10, 6), (25, 3), (10, 5)}. Consider the following three relational algebra queries RA1, RA2 and RA3 :

RA1 : T1 $\bowtie_{\text{T1.P = T2.A}}$ T2 where $\bowtie$ is natural join symbol

RA2 : T1 ⟕$_{\text{T1.P = T2.A}}$ T2 where ⟕ is left outer join symbol

RA3 : T1 $\bowtie_{\text{T1.P = T2.A and T1.R = T2.C}}$ T2

The number of tuples in the resulting table of RA1, RA2 and RA3 are given by :

(1) 2, 4, 2 respectively
(2) 2, 3, 2 respectively
(3) 3, 3, 1 respectively
(4) 3, 4, 1 respectively

10. Consider the table R with attributes A, B and C. The functional dependencies that hold on R are : $A \rightarrow B$, $C \rightarrow AB$. Which of the following statements is/are True ?

I. The decomposition of R into R1(C, A) and R2(A, B) is lossless.

II. The decomposition of R into R1(A, B) and R2(B, C) is lossy.

(1) Only I
(2) Only II
(3) Both I and II
(4) Neither I nor II

11. Consider the following ORACLE relations :

One (x, y) = {<2, 5>, <1, 6>, <1, 6>, <1, 6>, <4, 8>, <4, 8>}

Two (x, y) = {<2, 55>, <1, 1>, <4, 4>, <1, 6>, <4, 8>, <4, 8>, <9, 9>, <1, 6>}

Consider the following two SQL queries SQ1 and SQ2 :

```
SQ1 : SELECT * FROM One)
          EXCEPT
      (SELECT * FROM Two);
SQ2 : SELECT * FROM One)
        EXCEPT ALL
      (SELECT * FROM Two);
```

For each of the SQL queries, what is the cardinality (number of rows) of the result obtained when applied to the instances above ?

(1) 2 and 1 respectively
(2) 1 and 2 respectively
(3) 2 and 2 respectively
(4) 1 and 1 respectively

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12. Which one of the following pairs is correctly matched in the context of database design ?

List – I (Database term)		List – II (Definition)
I. Specialization	A.	Result of taking the union of two or more disjoint (lower-level) entity sets to produce a higher-level entity set.
II. Generalization	B.	Express the number of entities to which another entity can be associated via a relationship set.
III. Aggregation	C.	Result of taking a subset of a higher-level entity set to form a lower-level entity set.
IV. Mapping cardinalities	D.	An abstraction in which relationship sets (along with their associated entity sets) are treated as higher-level entity sets, and can participate in relationships.

Codes :

	I	II	III	IV
(1)	D	A	B	C
(2)	D	C	B	A
(3)	C	D	A	B
(4)	C	A	D	B

13. Consider a raster grid having XY-axes in positive X-direction and positive upward Y-direction with $X_{max} = 10$, $X_{min} = -5$, $Y_{max} = 11$, and $Y_{min} = 6$. What is the address of memory pixel with location (5, 4) in raster grid assuming base address 1 (one) ?

(1) 150
(2) 151
(3) 160
(4) 161

14. Consider a N-bit plane frame buffer with W-bit wide lookup table with W > N. How many intensity levels are available at a time ?

(1) 2^N
(2) 2^W
(3) 2^{N+W}
(4) 2^{N-1}

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15. Consider the Breshenham's line generation algorithm for a line with gradient greater than one, current point (x_i, y_i) and decision parameter, d_i. The next point to be plotted (x_{i+1}, y_{i+1}) and updated decision parameter, d_{i+1}, for $d_i < 0$ are given as _______.

(1) $x_{i+1} = x_i+1$

$y_{i+1} = y_i$

$d_{i+1} = d_i + 2\ dy$

(2) $x_{i+1} = x_i$

$y_{i+1} = y_i + 1$

$d_{i+1} = d_i + 2\ dx$

(3) $x_{i+1} = x_i$

$y_{i+1} = y_i + 1$

$d_{i+1} = d_i + 2\ (dx - dy)$

(4) $x_{i+1} = x_i + 1$

$y_{i+1} = y_i + 1$

$d_{i+1} = d_i + 2\ (dy - dx)$

16. A point P(2, 5) is rotated about a pivot point (1, 2) by 60°. What is the new transformed point P' ?

(1) (1, 4) (2) (–1, 4)

(3) (1, – 4) (4) (– 4, 1)

17. In perspective projection (from 3D to 2D), objects behind the centre of projection are projected upside down and backward onto the view-plane. This is known as _____.

(1) Topological distortion

(2) Vanishing point

(3) View confusion

(4) Perspective foreshortening

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18. The Liang-Barsky line clipping algorithm uses the parametric equation of a line from (x_1, y_1) to (x_2, y_2) along with its infinite extension which is given as :

$x = x_1 + \Delta x.u$

$y = y_1 + \Delta y.u$

Where $\Delta x = x_2 - x_1$, $\Delta y = y_2 - y_1$, and u is the parameter with $0 \le u \le 1$. A line AB with end points A(–1, 7) and B(11, 1) is to be clipped against a rectangular window with $x_{min} = 1$, $x_{max} = 9$, $y_{min} = 2$, and $y_{max} = 8$. The lower and upper bound values of the parameter u for the clipped line using Liang-Barsky algorithm is given as :

(1) $(0, \frac{2}{3})$ (2) $\left(\frac{1}{6}, \frac{5}{6}\right)$

(3) $(0, \frac{1}{3})$ (4) (0, 1)

19. Match the following with reference to Functional programming history :

a.	Lambda calculus	i.	Church, 1932
b.	Lambda calculus as programming language	ii.	Wordsworth, 1970
c.	Lazy evaluation	iii.	Haskel, 1990
d.	Type classes	iv.	Mecarthy, 1960

Codes :

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

20. Aliasing in the context of programming languages refers to :

(1) Multiple variables having the same location

(2) Multiple variables having the same identifier

(3) Multiple variables having the same value

(4) Multiple use of same variable

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21. Assume that the program 'P' is implementing parameter passing with 'call by reference'. What will be printed by following print statements in P ?

```
Program P( )
{
   x = 10;
   y = 3;
   funb (y, x, x)
   print x;
   print y;
}
   funb (x, y, z)
   {
     y = y + 4;
     z = x + y + z;
   }
```

(1) 10, 7
(2) 31, 3
(3) 10, 3
(4) 31, 7

22. The regular grammar for the language $L = \{a^n b^m \mid n + m \text{ is even}\}$ is given by

(1) $S \rightarrow S_1 \mid S_2$
$S_1 \rightarrow a\, S_1 \mid A_1$
$A_1 \rightarrow b\, A_1 \mid \lambda$
$S_2 \rightarrow aaS_2 \mid A_2$
$A_2 \rightarrow b\, A_2 \mid \lambda$

(2) $S \rightarrow S_1 \mid S_2$
$S_1 \rightarrow a\, S_1 \mid a\, A_1$
$S_2 \rightarrow aa\, S_2 \mid A_2$
$A_1 \rightarrow bA_1 \mid \lambda$
$A_2 \rightarrow bA_2 \mid \lambda$

(3) $S \rightarrow S_1 \mid S_2$
$S_1 \rightarrow aaa\, S_1 \mid aA_1$
$S_2 \rightarrow aaS_2 \mid A_2$
$A_1 \rightarrow bA_1 \mid \lambda$
$A_2 \rightarrow bA_2 \mid \lambda$

(4) $S \rightarrow S_1 \mid S_2$
$S_1 \rightarrow aa\, S_1 \mid A_1$
$S_2 \rightarrow aaS_2 \mid aA_2$
$A_1 \rightarrow bbA_1 \mid \lambda$
$A_2 \rightarrow bbA_2 \mid b$

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23. Let $\Sigma = \{a, b\}$ and language $L = \{aa, bb\}$. Then, the complement of L is

(1) $\{\lambda, a, b, ab, ba\} \cup \{w \in \{a, b\}^* \mid |w| > 3\}$

(2) $\{a, b, ab, ba\} \cup \{w \in \{a, b\}^* \mid |w| \geq 3\}$

(3) $\{w \in \{a, b\}^* \mid |w| > 3\} \cup \{a, b, ab, ba\}$

(4) $\{\lambda, a, b, ab, ba\} \cup \{w \in \{a, b\}^* \mid |w| \geq 3\}$

24. Consider the following identities for regular expressions :

(a) $(r + s)^* = (s + r)^*$

(b) $(r^*)^* = r^*$

(c) $(r^* s^*)^* = (r + s)^*$

Which of the above identities are true ?

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

(3) (c) and (a) only (4) (a), (b) and (c)

25. Suppose transmission rate of a channel is 32 kbps. If there are '8' routes from source to destination and each packet p contains 8000 bits. Total end to end delay in sending packet P is _____.

(1) 2 sec (2) 3 sec

(3) 4 sec (4) 1 sec

26. Consider the following statements :

A. High speed Ethernet works on optic fiber.

B. A point to point protocol over Ethernet is a network protocol for encapsulating PPP frames inside Ethernet frames.

C. High speed Ethernet does not work on optic fiber.

D. A point to point protocol over Ethernet is a network protocol for encapsulating Ethernet frames inside PPP frames.

Which of the following is correct ?

(1) A and B are true; C and D are false.

(2) A and B are false; C and D are true.

(3) A, B, C and D are true.

(4) A, B, C and D are false.

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27. In CRC checksum method, assume that given frame for transmission is 1101011011 and the generator polynomial is $G(x) = x^4 + x + 1$.

After implementing CRC encoder, the encoded word sent from sender side is _____.

(1) 11010110111110

(2) 11101101011011

(3) 110101111100111

(4) 110101111001111

28. A slotted ALOHA network transmits 200 bits frames using a shared channel with 200 kbps bandwidth. If the system (all stations put together) produces 1000 frames per second, then the throughput of the system is _______.

(1) 0.268 (2) 0.468

(3) 0.368 (4) 0.568

29. An analog signal has a bit rate of 8000 bps and a baud rate of 1000.

Then analog signal has _____ signal elements and carry _____ data elements in each signal.

(1) 256, 8 bits

(2) 128, 4 bits

(3) 256, 4 bits

(4) 128, 8 bits

30. The plain text message BAHI encrypted with RSA algorithm using e = 3, d = 7 and n = 33 and the characters of the message are encoded using the values 00 to 25 for letters A to Z. Suppose character by character encryption was implemented. Then, the Cipher Text message is _____.

(1) ABHI

(2) HAQC

(3) IHBA

(4) BHQC

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31. Consider the problem of a chain <A_1, A_2, A_3, A_4> of four matrices. Suppose that the dimensions of the matrices A_1, A_2, A_3 and A_4 are 30×35, 35×15, 15×5 and 5×10 respectively. The minimum number of scalar multiplications needed to compute the product $A_1A_2A_3A_4$ is ____.

(1) 14875 (2) 21000

(3) 9375 (4) 11875

32. Consider a hash table of size m = 10000, and the hash function h(K) = floor (m(KA mod 1)) for $A = (\sqrt{5} - 1)/2$. The key 123456 is mapped to location ______.

(1) 46 (2) 41

(3) 43 (4) 48

33. Consider a weighted complete graph G on the vertex set $\{\nu_1, \nu_2, ... \nu_n\}$ such that the weight of the edge (ν_i, ν_j) is $4 \mid i - j \mid$. The weight of minimum cost spanning tree of G is :

(1) $4n^2$ (2) n

(3) $4n - 4$ (4) $2n - 2$

34. A priority queue is implemented as a max-heap. Initially, it has five elements. The level-order traversal of the heap is as follows :

20, 18, 15, 13, 12

Two new elements '10' and '17' are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the element is :

(1) 20, 18, 17, 15, 13, 12, 10

(2) 20, 18, 17, 12, 13, 10, 15

(3) 20, 18, 17, 10, 12, 13, 15

(4) 20, 18, 17, 13, 12, 10, 15

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35. If there are n integers to sort, each integer has d digits, and each digit is in the set {1, 2, …, k}, radix sort can sort the numbers in :

(1) O (k (n + d))   (2) O (d (n + k))

(3) O ((n + k) l g d)   (4) O ((n + d) l g k)

36. Match the following :

a.	Prim's algorithm	i.	$O(V^2E)$
b.	Bellman-Ford algorithm	ii.	O(VE lgV)
c.	Floyd-Warshall algorithm	iii.	O(E lgV)
d.	Johnson's algorithm	iv.	$O(V^3)$

Where V is the set of nodes and E is the set of edges in the graph.

Codes :

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

37. Constructors have _____ return type.

(1) void   (2) char

(3) int   (4) no

38. Method over-riding can be prevented by using final as a modifier at ______.

(1) the start of the class.

(2) the start of method declaration.

(3) the start of derived class.

(4) the start of the method declaration in the derived class.

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39. Which of the following is a correct statement ?

(1) Composition is a strong type of association between two classes with full ownership.

(2) Composition is a strong type of association between two classes with partial ownership.

(3) Composition is a weak type of association between two classes with partial ownership.

(4) Composition is a weak type of association between two classes with strong ownership.

40. Which of the following is not a correct statement ?

(1) Every class containing abstract method must be declared abstract.

(2) Abstract class can directly be initiated with 'new' operator.

(3) Abstract class can be initiated.

(4) Abstract class does not contain any definition of implementation.

41. Which of the following tag in HTML is used to surround information, such as signature of the person who created the page ?

(1) <body> </body> (2) <address> </address>

(3)   (4)

42. Java uses threads to enable the entire environment to be ______.

(1) Symmetric (2) Asymmetric

(3) Synchronous (4) Asynchronous

43. An Operating System (OS) crashes on the average once in 30 days, that is, the Mean Time Between Failures (MTBF) = 30 days. When this happens, it takes 10 minutes to recover the OS, that is, the Mean Time To Repair (MTTR) = 10 minutes. The availability of the OS with these reliability figures is approximately :

(1) 96.97% (2) 97.97%

(3) 99.009% (4) 99.97%

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44. Match each software lifecycle model in List – I to its description in List – II :

List – I	List – II
I. Code-and-Fix	a. Assess risks at each step; do most critical action first.
II. Evolutionary prototyping	b. Build an initial small requirement specifications, code it, then "evolve" the specifications and code as needed.
III. Spiral	c. Build initial requirement specification for several releases, then design-and-code in sequence
IV. Staged Delivery	d. Standard phases (requirements, design, code, test) in order
V. Waterfall	e. Write some code, debug it, repeat (i.e. ad-hoc)

Codes :

	I	II	III	IV	V
(1)	e	b	a	c	d
(2)	e	c	a	b	d
(3)	d	a	b	c	e
(4)	c	e	a	b	d

45. Match each software term in List – I to its description in List – II :

List – I	List – II
I. Wizards	a. Forms that provide structure for a document
II. Templates	b. A series of commands grouped into a single command
III. Macro	c. A single program that incorporates most commonly used tools
IV. Integrated Software	d. Step-by-step guides in application software
V. Software Suite	e. Bundled group of software programs

Codes :

	I	II	III	IV	V
(1)	d	a	b	c	e
(2)	b	a	d	c	e
(3)	d	e	b	a	c
(4)	e	c	b	a	d

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46. The ISO quality assurance standard that applies to software Engineering is

(1) ISO 9000 : 2004 (2) ISO 9001 : 2000

(3) ISO 9002 : 2001 (4) ISO 9003 : 2004

47. Which of the following are external qualities of a software product ?

(1) Maintainability, reusability, portability, efficiency, correctness.

(2) Correctness, reliability, robustness, efficiency, usability.

(3) Portability, interoperability, maintainability, reusability.

(4) Robustness, efficiency, reliability, maintainability, reusability.

48. Which of the following is/are CORRECT statement(s) about version and release ?

I. A version is an instance of a system, which is functionally identical but non-functionally distinct from other instances of a system.

II. A version is an instance of a system, which is functionally distinct in some way from other system instances.

III. A release is an instance of a system, which is distributed to users outside of the development team.

IV. A release is an instance of a system, which is functionally identical but non-functionally distinct from other instances of a system.

(1) I and III (2) II and IV

(3) I and IV (4) II and III

49. The Unix Operating System Kernel maintains two key data structures related to processes, the process table and the user structure. Now, consider the following two statements :

I. The process table is resident all the time and contain information needed for all processes, even those that are not currently in memory.

II. The user structure is swapped or paged out when its associated process is not in memory, in order not to waste memory on information that is not needed.

Which of the following options is correct with reference to above statements ?

(1) Only (I) is correct. (2) Only (II) is correct.

(3) Both (I) and (II) are correct. (4) Both (I) and (II) are wrong.

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50. Consider a system which have 'n' number of processes and 'm' number of resource types. The time complexity of the safety algorithm, which checks whether a system is in safe state or not, is of the order of :

(1) $O(mn)$ (2) $O(m^2n^2)$

(3) $O(m^2n)$ (4) $O(mn^2)$

51. An operating system supports a paged virtual memory, using a central processor with a cycle time of one microsecond. It costs an additional one microsecond to access a page other than the current one. Pages have 1000 words, and the paging device is a drum that rotates at 3000 revolutions per minute and transfers one million words per second. Further, one percent of all instructions executed accessed a page other than the current page. The instruction that accessed another page, 80% accessed a page already in memory and when a new page was required, the replaced page was modified 50% of the time. What is the effective access time on this system, assuming that the system is running only one process and the processor is idle during drum transfers ?

(1) 30 microseconds

(2) 34 microseconds

(3) 60 microseconds

(4) 68 microseconds

52. Consider the following page reference string :

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

Which of the following options, gives the correct number of page faults related to LRU, FIFO, and optimal page replacement algorithms respectively, assuming 05 page frames and all frames are initially empty ?

(1) 10, 14, 8 (2) 8, 10, 7

(3) 7, 10, 8 (4) 7, 10, 7

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53. Consider a file currently consisting of 50 blocks. Assume that the file control block and the index block is already in memory. If a block is added at the end (and the block information to be added is stored in memory), then how many disk I/O operations are required for indexed (single-level) allocation strategy ?

(1) 1 (2) 101

(3) 27 (4) 0

54. An experimental file server is up 75% of the time and down for 25% of the time due to bugs. How many times does this file server have to be replicated to give an availability of at least 99% ?

(1) 2 (2) 4

(3) 8 (4) 16

55. Given the following two languages :

$L_1 = \{uww^R\nu \mid u, v, w \in \{a, b\}^+\}$

$L_2 = \{uww^R\nu \mid u, \nu, w \in \{a, b\}^+, |u| \geq |\nu|\}$

Which of the following is correct ?

(1) L_1 is regular language and L_2 is not regular language.

(2) L_1 is not regular language and L_2 is regular language.

(3) Both L_1 and L_2 are regular languages.

(4) Both L_1 and L_2 are not regular languages.

56. Given a Turing Machine

$M = (\{q_0, q_1\}, \{0, 1\}, \{0, 1, B\}, \delta, B, \{q_1\})$

Where δ is a transition function defined as

$\delta(q_0, 0) = (q_0, 0, R)$

$\delta(q_0, B) = (q_1, B, R)$

The language L(M) accepted by Turing machine is given as :

(1) 0* 1* (2) 00*

(3) 10* (4) 1*0*

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57. Let G = (V, T, S, P) be a context-free grammar such that every one of its productions is of the form $A \rightarrow \nu$, with $|\nu| = k > 1$. The derivation tree for any string $W \in L(G)$ has a height such that

(1) $h < \frac{(|W| - 1)}{k - 1}$ (2) $\log_k |W| \leq h$

(3) $\log_k|W| < h < \frac{(|W| - 1)}{k - 1}$ (4) $\log_k|W| \leq h \leq \frac{(|W| - 1)}{k - 1}$

58. Which of the following is not used in standard JPEG image compression ?

(1) Huffman coding (2) Runlength encoding

(3) Zig-zag scan (4) K-L Transform

59. Which of the following is a source coding technique ?

(1) Huffman coding (2) Arithmetic coding

(3) Run-length coding (4) DPCM

60. If the histogram of an image is clustered towards origin on X-axis of a histogram plot then it indicates that the image is ______.

(1) Dark (2) Good contrast

(3) Bright (4) Very low contrast

61. Consider the following linear programming problem :

Max. $z = 0.50\ x_2 - 0.10x_1$

Subject to the constraints

$2x_1 + 5x_2 \leq 80$

$x_1 + x_2 \leq 20$

and $x_1, x_2 \geq 0$

The total maximum profit (z) for the above problem is :

(1) 6 (2) 8

(3) 10 (4) 12

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62. Consider the following statements :

(a) If primal (dual) problem has a finite optimal solution, then its dual (primal) problem has a finite optimal solution.

(b) If primal (dual) problem has an unbounded optimum solution, then its dual (primal) has no feasible solution at all.

(c) Both primal and dual problems may be infeasible.

Which of the following is correct ?

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

63. Consider the following statements :

(a) Assignment problem can be used to minimize the cost.

(b) Assignment problem is a special case of transportation problem.

(c) Assignment problem requires that only one activity be assigned to each resource.

Which of the following options is correct ?

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

64. What are the following sequence of steps taken in designing a fuzzy logic machine ?

(1) Fuzzification $\rightarrow$ Rule evaluation $\rightarrow$ Defuzzification

(2) Fuzzification $\rightarrow$ Defuzzification $\rightarrow$ Rule evaluation

(3) Rule evaluation $\rightarrow$ Fuzzification $\rightarrow$ Defuzzification

(4) Rule evaluation $\rightarrow$ Defuzzification $\rightarrow$ Fuzzification

65. Which of the following 2 input Boolean logic functions is linearly inseparable ?

(a) AND
(b) OR
(c) NOR
(d) XOR
(e) NOT XOR

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

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66. Let R and S be two fuzzy relations defined as

$$R = \begin{array}{c c} & \begin{array}{cc} y_1 & y_2 \end{array} \\ \begin{array}{c} x_1 \\ x_2 \end{array} & \begin{bmatrix} 0.7 & 0.5 \\ 0.8 & 0.4 \end{bmatrix} \end{array}$$

and $$S = \begin{array}{c c} & \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{array}{c} y_1 \\ y_2 \end{array} & \begin{bmatrix} 0.9 & 0.6 & 0.2 \\ 0.1 & 0.7 & 0.5 \end{bmatrix} \end{array}$$

Then, the resulting relation, T, which relates elements of universe of X to elements of universe of Z using max-product composition is given by

(1) $$T = \begin{array}{c c} & \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{array}{c} x_1 \\ x_2 \end{array} & \begin{bmatrix} 0.68 & 0.89 & 0.39 \\ 0.76 & 0.72 & 0.32 \end{bmatrix} \end{array}$$

(2) $$T = \begin{array}{c c} & \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{array}{c} x_1 \\ x_2 \end{array} & \begin{bmatrix} 0.68 & 0.89 & 0.39 \\ 0.72 & 0.76 & 0.32 \end{bmatrix} \end{array}$$

(3) $$T = \begin{array}{c c} & \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{array}{c} x_1 \\ x_2 \end{array} & \begin{bmatrix} 0.63 & 0.42 & 0.25 \\ 0.72 & 0.48 & 0.20 \end{bmatrix} \end{array}$$

(4) $$T = \begin{array}{c c} & \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{array}{c} x_1 \\ x_2 \end{array} & \begin{bmatrix} 0.05 & 0.35 & 0.14 \\ 0.04 & 0.28 & 0.16 \end{bmatrix} \end{array}$$

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67. Consider the following operations to be performed in Unix :

"The pipe sorts all files in the current directory modified in the month of "June" by order of size and prints them to the terminal screen. The sort option skips ten fields then sorts the lines in numeric order."

Which of the following Unix command will perform above set of operations ?

(1) ls – l | grep "June" | sort + 10n

(2) ls – l | grep "June" | sort + 10r

(3) ls – l | grep – v "June" | sort + 10n

(4) ls – l | grep – n "June" | sort + 10x

68. Which of the following statements is incorrect for a Windows Multiple Document Interface (MDI) ?

(1) Each document in an MDI application is displayed in a separate child window within the client area of the application's main window.

(2) An MDI application has three kinds of windows namely a frame window, an MDI client window and number of child windows.

(3) An MDI application can support more than one kind of document.

(4) An MDI application displays output in the client area of the frame window.

69. Which of the following statement(s) is/are True regarding 'nice' command of UNIX ?

I. It is used to set or change the priority of a process.

II. A process's nice value can be set at the time of creation.

III. 'nice' takes a command line as an argument.

(1) I, II only (2) II, III only

(3) I, II, III (4) I, III only

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70. Let $\nu(x)$ mean x is a vegetarian, m(y) for y is meat, and $e(x, y)$ for x eats y. Based on these, consider the following sentences :

I. $\forall x\ \nu(x) \Leftrightarrow (\forall y\ e(x, y) \Rightarrow \neg m(y))$

II. $\forall x\ \nu(x) \Leftrightarrow (\neg(\exists y\ m(y) \wedge e(x, y)))$

III. $\forall x\ (\exists y\ m(y) \wedge e(x, y)) \Leftrightarrow \neg\nu(x)$

One can determine that

(1) Only I and II are equivalent sentences

(2) Only II and III are equivalent sentences.

(3) Only I and III are equivalent sentence .

(4) I, II, and III are equivalent sentences.

71. Match each Artificial Intelligence term in List-I that best describes a given situation in List – II :

	List – I		**List – II**
I.	Semantic Network	a.	Knowledge about what to do as opposed to how to do it.
II.	Frame	b.	A premise of a rule that is not concluded by any rule.
III.	Declarative knowledge	c.	A method of knowledge representation that uses a graph.
IV.	Primitive	d.	A data structure representing stereotypical knowledge.

Codes :

	I	II	III	IV
(1)	d	a	b	c
(2)	d	c	a	b
(3)	d	c	b	a
(4)	c	d	a	b

72. In Artificial Intelligence , a semantic network

(1) is a graph-based method of knowledge representation where nodes represent concepts and arcs represent relations between concepts.

(2) is a graph-based method of knowledge representation where nodes represent relations between concepts and arcs represent concepts.

(3) represents an entity as a set of slots and associated rules.

(4) is a subset of first-order logic.

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73. Criticism free idea generation is a factor of _____.

(1) Decision Support System

(2) Group Decision Support System

(3) Enterprise Resource Support System

(4) Artificial Intelligence

74. Consider the following logical inferences :

I_1 : If it is Sunday then school will not open.

The school was open.

Inference : It was not Sunday.

I_2 : If it is Sunday then school will not open.

It was not Sunday.

Inference : The school was open.

Which of the following is correct ?

(1) Both I_1 and I_2 are correct inferences.

(2) I_1 is correct but I_2 is not a correct inference.

(3) I_1 is not correct but I_2 is a correct inference.

(4) Both I_1 and I_2 are not correct inferences.

75. Which formal system provides the semantic foundation for Prolog ?

(1) Predicate calculus

(2) Lambda calculus

(3) Hoare logic

(4) Propositional logic

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