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 A 0 8 7 1 7

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

Number of Pages in this Booklet : **16**

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.
   (iv) The test booklet no. and OMR sheet no. should be same. In case of discrepancy in the number, the candidate should immediately report the matter to the invigilator for replacement of the test booklet / OMR Sheet.
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 on conclusion of examination.
10. **Use only Black Ball point pen.**
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 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 ।
   (iv) प्रश्न पुस्तिका नं. और OMR पत्रक नं. समान होने चाहिए । यदि नंबर भिन्न हों, तो परीक्षार्थी प्रश्न-पुस्तिका / OMR पत्रक बदलने के लिए निरीक्षक को तुरंत सूचित करें ।
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 अपने साथ ले जा सकते हैं ।
10. **काले बाल प्वाईट 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 ।**

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

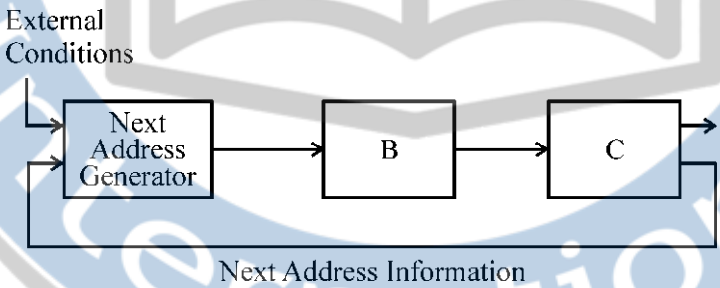
1. Which of the following is an interrupt according to temporal relationship with system clock ?

(1) Maskable interrupt (2) Periodic interrupt
(3) Division by zero (4) Synchronous interrupt

2. Which of the following is incorrect for virtual memory ?

(1) Large programs can be written
(2) More I/O is required
(3) More addressable memory available
(4) Faster and easy swapping of process

3. The general configuration of the microprogrammed control unit is given below :



What are blocks B and C in the diagram respectively ?

(1) Block address register and cache memory
(2) Control address register and control memory
(3) Branch register and cache memory
(4) Control address register and random access memory

4. Match the following :

Addressing Mode		**Location of operand**
a. Implied	i.	Registers which are in CPU
b. Immediate	ii.	Register specifies the address of the operand.
c. Register	iii.	Specified in the register
d. Register Indirect	iv.	Specified implicitly in the definition of instruction

Codes :

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

5. In 8085 microprocessor, the digit 5 indicates that the microprocessor needs

(1) –5 volts, +5 volts supply (2) +5 volts supply only

(3) –5 volts supply only (4) 5 MHz clock

6. In 8085, which of the following performs : load register pair immediate operation ?

(1) LDAX rp (2) LHLD addr

(3) LXI rp, data (4) INX rp

7. Consider following schedules involving two transactions :

S_1 : $r_1(X)$; $r_1(Y)$; $r_2(X)$; $r_2(Y)$; $w_2(Y)$; $w_1(X)$

S_2 : $r_1(X)$; $r_2(X)$; $r_2(Y)$; $w_2(Y)$; $r_1(Y)$; $w_1(X)$

Which of the following statement is true ?

(1) Both S_1 and S_2 are conflict serializable.

(2) S_1 is conflict serializable and S_2 is not conflict serializable.

(3) S_1 is not conflict serializable and S_2 is conflict serializable.

(4) Both S_1 and S_2 are not conflict serializable.

8. Which one is correct w.r.t. RDBMS ?

(1) primary key $\subseteq$ super key $\subseteq$ candidate key

(2) primary key $\subseteq$ candidate key $\subseteq$ super key

(3) super key $\subseteq$ candidate key $\subseteq$ primary key

(4) super key $\subseteq$ primary key $\subseteq$ candidate key

9. Let pk(R) denotes primary key of relation R. A many-to-one relationship that exists between two relations R_1 and R_2 can be expressed as follows :

(1) $pk(R_2) \rightarrow pk(R_1)$ (2) $pk(R_1) \rightarrow pk(R_2)$

(3) $pk(R_2) \rightarrow R_1 \cap R_2$ (4) $pk(R_1) \rightarrow R_1 \cap R_2$

10. For a database relation R(A, B, C, D) where the domains of A, B, C and D include only atomic values, only the following functional dependencies and those that can be inferred from them are :

$A \rightarrow C$

$B \rightarrow D$

The relation R is in _____.

(1) First normal form but not in second normal form.

(2) Both in first normal form as well as in second normal form.

(3) Second normal form but not in third normal form.

(4) Both in second normal form as well as in third normal form.

11. Consider the following relation :

Works (emp_name, company_name, salary)

Here, emp_name is primary key.

Consider the following SQL query

```
Select emp_name
From works T
where salary > (select avg (salary)
                from works S
                where T.company _ name =
                      S.company _ name)
```

The above query is for following :

(1) Find the highest paid employee who earns more than the average salary of all employees of his company.

(2) Find the highest paid employee who earns more than the average salary of all the employees of all the companies.

(3) Find all employees who earn more than the average salary of all employees of all the companies.

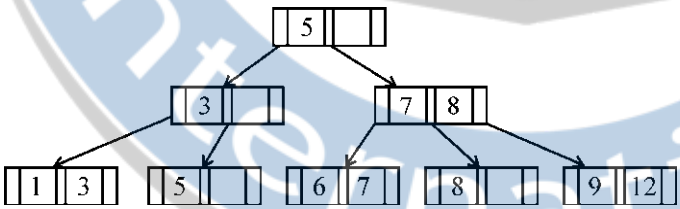
(4) Find all employees who earn more than the average salary of all employees of their company.

12. If following sequence of keys are inserted in a B+ tree with K(=3) pointers :

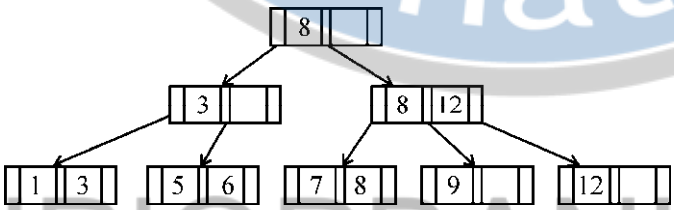
8, 5, 1, 7, 3, 12, 9, 6

Which of the following shall be correct B+ tree ?

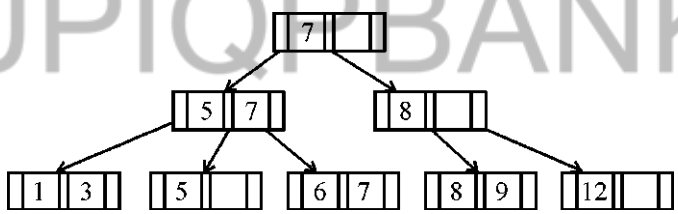
(1)



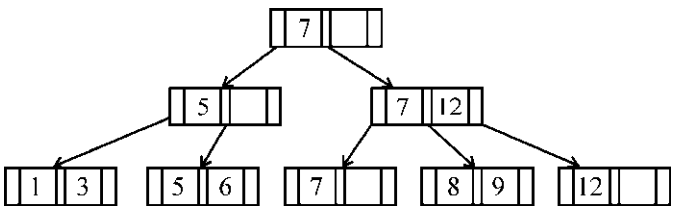
(2)



(3)



(4)



13. Which of the following statement(s) is/are correct ?

(1) Persistence is the term used to describe the duration of phosphorescence.
(2) The control electrode is used to turn the electron beam on and off.
(3) The electron gun creates a source of electrons which are focussed into a narrow beam directed at the face of CRT.
(4) All of the above

14. A segment is any object described by GKS commands and data that start with CREATE SEGMENT and Terminates with CLOSE SEGMENT command. What functions can be performed on these segments ?

(1) Translation and Rotation
(2) Panning and Zooming
(3) Scaling and Shearing
(4) Translation, Rotation, Panning and Zooming

15. Match the following :

a.	Glass	i.	Contains liquid crystal and serves as a bonding surface for a conductive coating.
b.	Conductive coating	ii.	Acts as a conductor so that a voltage can be applied across the liquid crystal.
c.	Liquid crystal	iii.	A substance which will polarize light when a voltage is applied to it.
d.	Polarized film	iv.	A transparent sheet that polarizes light.

Codes :

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

16. Below are the few steps given for scan-converting a circle using Bresenham's Algorithm. Which of the given steps is not correct ?

(1) Compute d = 3 – 2r (where r is radius)
(2) Stop if $x > y$
(3) If $d < 0$, then $d = 4x + 6$ and $x = x + 1$
(4) If $d \geq 0$, then $d = 4 * (x - y) + 10$, $x = x + 1$ and $y = y + 1$

17. Which of the following is/are side effects of scan conversion ?

a. Aliasing
b. Unequal intensity of diagonal lines
c. Overstriking in photographic applications
d. Local or Global aliasing

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

18. Consider a line AB with A = (0, 0) and B = (8, 4). Apply a simple DDA algorithm and compute the first four plots on this line.

(1) [(0, 0), (1, 1), (2, 1), (3, 2)] (2) [(0, 0), (1, 1.5), (2, 2), (3, 3)]
(3) [(0, 0), (1, 1), (2, 2.5), (3, 3)] (4) [(0, 0), (1, 2), (2, 2), (3, 2)]

19. Which of the following are not regular ?

(A) Strings of even number of a's.

(B) Strings of a's, whose length is a prime number.

(C) Set of all palindromes made up of a's and b's.

(D) Strings of a's whose length is a perfect square.

(1) (A) and (B) only (2) (A), (B) and (C) only

(3) (B), (C) and (D) only (4) (B) and (D) only

20. Consider the languages $L_1 = \phi$ and $L_2 = \{1\}$. Which one of the following represents $L_1^* \cup L_2^* L_1^*$?

(1) $\{\in\}$ (2) $\{\in, 1\}$

(3) ϕ (4) 1^*

21. Given the following statements :

(A) A class of languages that is closed under union and complementation has to be closed under intersection.

(B) A class of languages that is closed under union and intersection has to be closed under complementation.

Which of the following options is correct ?

(1) Both (A) and (B) are false. (2) Both (A) and (B) are true.

(3) (A) is true, (B) is false. (4) (A) is false, (B) is true.

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

(1) $\log_K|W| \le h \le \log_K\left(\frac{|W|-1}{K-1}\right)$ (2) $\log_K|W| \le h \le \log_K(K|W|)$

(3) $\log_K|W| \le h \le K \log_K|W|$ (4) $\log_K|W| \le h \le \left(\frac{|W|-1}{K-1}\right)$

23. Given the following two languages :

$L_1 = \{a^n b^n \mid n \ge 0, n \ne 100\}$

$L_2 = \{w \in \{a, b, c\}^* \mid n_a(w) = n_b(w) = n_c(w)\}$

Which of the following options is correct ?

(1) Both L_1 and L_2 are not context free language

(2) Both L_1 and L_2 are context free language.

(3) L_1 is context free language, L_2 is not context free language.

(4) L_1 is not context free language, L_2 is context free language.

24. A recursive function h, is defined as follows :

h(m) = k, if m = 0

= 1, if m = 1

= 2 h(m – 1) + 4h(m – 2), if m ≥ 2

If the value of h(4) is 88 then the value of k is :

(1) 0 (2) 1

(3) 2 (4) –1

25. Suppose there are n stations in a slotted LAN. Each station attempts to transmit with a probability P in each time slot. The probability that only one station transmits in a given slot is _____.

(1) $nP(1 - P)^{n-1}$ (2) nP

(3) $P(1 - P)^{n-1}$ (4) $n^P(1 - P)^{n-1}$

26. Station A uses 32 byte packets to transmit messages to station B using sliding window protocol. The round trip delay between A and B is 40 milliseconds and the bottleneck bandwidth on the path between A and B is 64 kbps. The optimal window size of A is _____.

(1) 20 (2) 10

(3) 30 (4) 40

27. Let G(x) be generator polynomial used for CRC checking. The condition that should be satisfied by G(x) to correct odd numbered error bits, will be :

(1) $(1 + x)$ is factor of G(x) (2) $(1 - x)$ is factor of G(x)

(3) $(1 + x^2)$ is factor of G(x) (4) x is factor of G(x)

28. In a packet switching network, if the message size is 48 bytes and each packet contains a header of 3 bytes. If 24 packets are required to transmit the message, the packet size is _____.

(1) 2 bytes (2) 1 byte

(3) 4 bytes (4) 5 bytes

29. In RSA public key cryptosystem suppose $n = p * q$ where p and q are primes. (e, n) and (d, n) are public and private keys respectively. Let M be an integer such that $o < M < n$ and $\phi(n) = (p - 1)(q - 1)$.

Which of the following equations represent RSA public key cryptosystem ?

I. $C \equiv M^e \pmod n$
$M \equiv (C)^d \pmod n$

II. $ed \equiv 1 \pmod n$

III. $ed \equiv 1 \pmod{\phi(n)}$

IV. $C \equiv M^e \pmod{\phi(n)}$
$M \equiv C^d \pmod{\phi(n)}$

Codes :

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

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

30. A node X on a 10 Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2 Mbps. Token bucket is initially filled with 16 megabits. The maximum duration taken by X to transmit at full rate of 10 Mbps is _____ secs.

(1) 1 (2) 2

(3) 3 (4) 4

31. The asymptotic upper bound solution of the recurrence relation given by

$T(n) = 2T\left(\frac{n}{2}\right) + \frac{n}{\lg n}$ is :

(1) $O(n^2)$ (2) $O(n \lg n)$

(3) $O(n \lg \lg n)$ (4) $O(\lg \lg n)$

32. Any decision tree that sorts n elements has height _____.

(1) $\Omega(\lg n)$ (2) $\Omega(n)$

(3) $\Omega(n \lg n)$ (4) $\Omega(n^2)$

33. Red-black trees are one of many search tree schemes that are "balanced" in order to guarantee that basic dynamic-set operations take _____ time in the worst case.

(1) O(1) (2) O(*l*g n)
(3) O(n) (4) O(n *l*g n)

34. The minimum number of scalar multiplication required, for parenthesization of a matrix-chain product whose sequence of dimensions for four matrices is <5, 10, 3, 12, 5> is

(1) 630 (2) 580
(3) 480 (4) 405

35. Dijkstra's algorithm is based on

(1) Divide and conquer paradigm (2) Dynamic programming
(3) Greedy Approach (4) Backtracking paradigm

36. Match the following with respect to algorithm paradigms :

List – I	**List – II**
a. Merge sort	i. Dynamic programming
b. Huffman coding	ii. Greedy approach
c. Optimal polygon triangulation	iii. Divide and conquer
d. Subset sum problem	iv. Back tracking

Codes :

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

37. Abstraction and encapsulation are fundamental principles that underlie the object oriented approach to software development. What can you say about the following two statements ?

I. Abstraction allows us to focus on what something does without considering the complexities of how it works.
II. Encapsulation allows us to consider complex ideas while ignoring irrelevant detail that would confuse us.

(1) Neither I nor II is correct.
(2) Both I and II are correct.
(3) Only II is correct.
(4) Only I is correct.

38. Given the array of integers 'array' shown below :

13	7	27	2	18	33	9	11	22	8

What is the output of the following JAVA statements ?

```
int [ ] p = new int [10];
int [ ] q = new int [10];
for (int k = 0; k < 10; k ++)
        p[k] = array [k];
q = p;
p[4] = 20;
System.out.println(array [4] + ":" + q[4]);
```

(1) 20 : 20 (2) 18 : 18
(3) 18 : 20 (4) 20 : 18

39. Consider the following JAVA program :

```
public class First {
        public static int CBSE (int x) {
                if (x < 100) x = CBSE (x + 10);
                return (x – 1);
            }
        public static void main (String[] args){
            System.out.print(First.CBSE(60));
        }
}
```

What does this program print ?

(1) 59 (2) 95
(3) 69 (4) 99

40. Which of the following statement(s) with regard to an abstract class in JAVA is/are TRUE ?

I. An abstract class is one that is not used to create objects.
II. An abstract class is designed only to act as a base class to be inherited by other classes.

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

41. Which of the following HTML code will affect the vertical alignment of the table content ?

(1) <td style = “vertical-align : middle”> Text Here </td>
(2) <td valign = “centre”> Text Here </td>
(3) <td style = “text-align : center”> Text Here </td>
(4) <td align = “middle”> Text Here </td>

42. What can you say about the following statements ?

I. XML tags are case-insensitive.
II. In JavaScript, identifier names are case-sensitive.
III. Cascading Style Sheets (CSS) cannot be used with XML.
IV. All well-formed XML documents must contain a document type definition.

(1) only I and II are false. (2) only III and IV are false.
(3) only I and III are false. (4) only II and IV are false.

43. Which of the following statement(s) is/are TRUE with regard to software testing ?

I. Regression testing technique ensures that the software product runs correctly after the changes during maintenance.
II. Equivalence partitioning is a white-box testing technique that divides the input domain of a program into classes of data from which test cases can be derived.

(1) only I (2) only II
(3) both I and II (4) neither I nor II

44. Which of the following are facts about a top-down software testing approach ?

I. Top-down testing typically requires the tester to build method stubs.
II. Top-down testing typically requires the tester to build test drivers.

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

45. Match the terms related to Software Configuration Management (SCM) in List – I with the descriptions in List – II.

List – I		**List – II**
I. Version	A.	An instance of a system that is distributed to customers.
II. Release	B.	An instance of a system which is functionally identical to other instances, but designed for different hardware/software configurations.
III. Variant	C.	An instance of a system that differs, in some way, from other instances.

Codes :

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

46. A software project was estimated at 352 Function Points (FP). A four person team will be assigned to this project consisting of an architect, two programmers, and a tester. The salary of the architect is ₹ 80,000 per month, the programmer ₹ 60,000 per month and the tester ₹ 50,000 per month. The average productivity for the team is 8 FP per person month. Which of the following represents the projected cost of the project ?

(1) ₹ 28,16,000 (2) ₹ 20,90,000

(3) ₹ 26,95,000 (4) ₹ 27,50,000

47. Complete each of the following sentences in List – I on the left hand side by filling in the word or phrase from the List – II on the right hand side that best completes the sentence :

List – I		**List – II**
I. Determining whether you have built the right system is called _____	A.	Software testing
II. Determining whether you have built the system right is called _____	B.	Software verification
III. _____ is the process of demonstrating the existence of defects or providing confidence that they do not appear to be present.	C.	Software debugging
IV. _____ is the process of discovering the cause of a defect and fixing it.	D.	Software validation

Codes :

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

48. A software company needs to develop a project that is estimated as 1000 function points and is planning to use JAVA as the programming language whose approximate lines of code per function point is accepted as 50. Considering a = 1.4 as multiplicative factor, b = 1.0 as exponention factor for the basic COCOMO effort equation and c = 3.0 as multiplicative factor, d = 0.33 as exponention factor for the basic COCOMO duration equation, approximately how long does the project take to complete ?

(1) 11.2 months (2) 12.2 months
(3) 13.2 months (4) 10.2 months

49. A memory management system has 64 pages with 512 bytes page size. Physical memory consists of 32 page frames. Number of bits required in logical and physical address are respectively :

(1) 14 and 15 (2) 14 and 29
(3) 15 and 14 (4) 16 and 32

50. Consider a disk queue with I/O requests on the following cylinders in their arriving order :
6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45
The disk head is assumed to be at cylinder 23 and moving in the direction of decreasing number of cylinders. Total number of cylinders in the disk is 150. The disk head movement using SCAN-scheduling algorithm is :

(1) 172 (2) 173
(3) 227 (4) 228

51. Match the following for Unix file system :

	List – I		**List – II**
a.	Boot block	i.	Information about file system, free block list, free inode list etc.
b.	Super block	ii.	Contains operating system files as well as program and data files created by users.
c.	Inode block	iii.	Contains boot program and partition table.
d.	Data block	iv.	Contains a table for every file in the file system. Attributes of files are stored here.

Codes :

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

52. Some of the criteria for calculation of priority of a process are :

a. Processor utilization by an individual process.
b. Weight assigned to a user or group of users.
c. Processor utilization by a user or group of processes

In fair share scheduler, priority is calculated based on :

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

53. One of the disadvantages of user level threads compared to Kernel level threads is
(1) If a user level thread of a process executes a system call, all threads in that process are blocked.
(2) Scheduling is application dependent.
(3) Thread switching doesn't require kernel mode privileges.
(4) The library procedures invoked for thread management in user level threads are local procedures.

54. Which statement is not correct about "init" process in Unix ?
(1) It is generally the parent of the login shell.
(2) It has PID 1.
(3) It is the first process in the system.
(4) Init forks and execs a 'getty' process at every port connected to a terminal.

55. Consider following two rules R1 and R2 in logical reasoning in Artificial Intelligence (AI) :

R1 : From $\alpha \supset \beta$

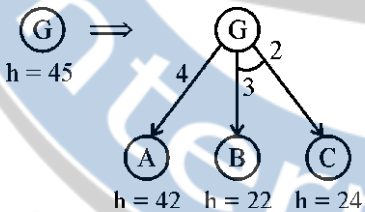
$$\frac{\text{and } \alpha}{\text{Inter } \beta}$$ is known as Modus Tollens (MT)

R2 : From $\alpha \supset \beta$

$$\frac{\text{and } \neg \beta}{\text{Inter } \neg \alpha}$$ is known as Modus Ponens (MP)

(1) Only R1 is correct. (2) Only R2 is correct.
(3) Both R1 and R2 are correct. (4) Neither R1 nor R2 is correct.

56. Consider the following AO graph :



Which is the best node to expand next by AO* algorithm ?
(1) A (2) B
(3) C (4) B and C

57. In Artificial Intelligence (AI), what is present in the planning graph ?
(1) Sequence of levels (2) Literals
(3) Variables (4) Heuristic estimates

58. What is the best method to go for the game playing problem ?
(1) Optimal Search (2) Random Search
(3) Heuristic Search (4) Stratified Search

59. Which of the following statements is true ?
(1) The sentence S is a logical consequence of $S_1,\ldots, S_n$ if and only if $S_1 \wedge S_2 \wedge \ldots\ldots \wedge S_n \rightarrow S$ is satisfiable.
(2) The sentence S is a logical consequence of $S_1,\ldots, S_n$ if and only if $S_1 \wedge S_2 \wedge \ldots\ldots \wedge S_n \rightarrow S$ is valid.
(3) The sentence S is a logical consequence of $S_1,\ldots, S_n$ if and only if $S_1 \wedge S_2 \wedge \ldots\ldots \wedge S_n \wedge \neg S$ is consistent.
(4) The sentence S is a logical consequence of $S_1,\ldots, S_n$ if and only if $S_1 \wedge S_2 \wedge \ldots\ldots \wedge S_n \wedge S$ is inconsistent.

60. The first order logic (FOL) statement $((R \vee Q) \wedge (P \vee \neg Q))$ is equivalent to which of the following ?

(1) $((R \vee \neg Q) \wedge (P \vee \neg Q) \wedge (R \vee P))$

(2) $((R \vee Q) \wedge (P \vee \neg Q) \wedge (R \vee P))$

(3) $((R \vee Q) \wedge (P \vee \neg Q) \wedge (R \vee \neg P))$

(4) $((R \vee Q) \wedge (P \vee \neg Q) \wedge (\neg R \vee P))$

61. Given the following two statements :

A. $L = \{w | n_a(w) = n_b(w)\}$ is deterministic context free language, but not linear.

B. $L = \{a^n b^n\} \cup \{a^n b^{2n}\}$ is linear, but not deterministic context free language.

Which of the following options is correct ?

(1) Both (A) and (B) are false. (2) Both (A) and (B) are true.

(3) (A) is true, (B) is false. (4) (A) is false, (B) is true.

62. Which of the following pairs have different expressive power ?

(1) Single-tape-turing machine and multi-dimensional turing machine.

(2) Multi-tape turing machine and multi-dimensional turing machine.

(3) Deterministic push down automata and non-deterministic pushdown automata.

(4) Deterministic finite automata and Non-deterministic finite automata

63. Which of the following statements is false ?

(1) Every context-sensitive language is recursive.

(2) The set of all languages that are not recursively enumerable is countable.

(3) The family of recursively enumerable languages is closed under union.

(4) The families of recursively enumerable and recursive languages are closed under reversal.

64. Let C be a binary linear code with minimum distance 2t + 1 then it can correct upto _____ bits of error.

(1) $t + 1$ (2) t

(3) $t - 2$ (4) $\frac{t}{2}$

65. A t-error correcting q-nary linear code must satisfy :

$$M \sum_{i=0}^{t} \binom{n}{i} (q-1)^i \leq X$$

Where M is the number of code words and X is

(1) q^n (2) q^t

(3) q^{-n} (4) q^{-t}

66. Names of some of the Operating Systems are given below :

(a) MS-DOS (b) XENIX (c) OS/2

In the above list, following operating systems didn't provide multiuser facility.

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

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

67. From the given data below :

a b b a a b b a a b

which one of the following is not a word in the dictionary created by LZ-coding (the initial words are a, b) ?

(1) a b (2) b b

(3) b a (4) b a a b

68. With respect to a loop in the transportation table, which one of the following is not correct ?

(1) Every loop has an odd no. of cells and atleast 5.
(2) Closed loops may or may not be square in shape.
(3) All the cells in the loop that have a plus or minus sign, except the starting cell, must be occupied cells.
(4) Every loop has an even no. of cells and atleast four.

69. At which of the following stage(s), the degeneracy do not occur in transportation problem ? (m, n represents number of sources and destinations respectively)

(a) While the values of dual variables u_i and v_j cannot be computed.
(b) While obtaining an initial solution, we may have less than m + n – 1 allocations.
(c) At any stage while moving towards optimal solution, when two or more occupied cells with the same minimum allocation become unoccupied simultaneously.
(d) At a stage when the no. of +ve allocation is exactly m + n – 1.

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

70. Consider the following LPP :

Min. Z = $x_1 + x_2 + x_3$

Subject to $3x_1 + 4x_3 \le 5$

$5x_1 + x_2 + 6x_3 = 7$

$8x_1 + 9x_3 \ge 2,$

$x_1, x_2, x_3 \ge 0$

The standard form of this LPP shall be :

(1) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 = 7;$

$8x_1 + 9x_3 – x_5 = 2;$

$x_1, x_2, x_3, x_4, x_5 \ge 0$

(2) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5 – 1(x_6) – 1(x_7)$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 + x_6 = 7;$

$8x_1 + 9x_3 – x_5 + x_7 = 2;$

x_1 to $x_7 \ge 0$

(3) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5 + 0x_6$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 = 7;$

$8x_1 + 9x_3 – x_5 + x_6 = 2;$

x_1 to $x_6 \ge 0$

(4) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5 + 0x_6 + 0x_7$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 + x_6 = 7;$

$8x_1 + 9x_3 – x_5 + x_7 = 2;$

x_1 to $x_7 \ge 0$

71. Let R and S be two fuzzy relations defined as :

$$R = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{cc} y_1 & y_2 \end{array} \\ \begin{bmatrix} 0.6 & 0.4 \\ 0.7 & 0.3 \end{bmatrix} \end{array} \text{ and } S = \begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.8 & 0.5 & 0.1 \\ 0.0 & 0.6 & 0.4 \end{bmatrix} \end{array}$$

Then, the resulting relation, T, which relates elements of universe *x* to the elements of universe z using max-min composition is given by :

(1) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.4 & 0.6 & 0.4 \\ 0.7 & 0.7 & 0.7 \end{bmatrix} \end{array}$

(2) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.4 & 0.6 & 0.4 \\ 0.8 & 0.5 & 0.4 \end{bmatrix} \end{array}$

(3) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.6 & 0.5 & 0.4 \\ 0.7 & 0.5 & 0.3 \end{bmatrix} \end{array}$

(4) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.6 & 0.5 & 0.5 \\ 0.7 & 0.7 & 0.7 \end{bmatrix} \end{array}$

72. A neuron with 3 inputs has the weight vector $[0.2 \; -0.1 \; 0.1]^T$ and a bias $\theta = 0$. If the input vector is $X = [0.2 \; 0.4 \; 0.2]^T$ then the total input to the neuron is :

(1) 0.20
(2) 1.0
(3) 0.02
(4) –1.0

73. Which of the following neural networks uses supervised learning ?

(A) Multilayer perceptron
(B) Self organizing feature map
(C) Hopfield network

(1) (A) only
(2) (B) only
(3) (A) and (B) only
(4) (A) and (C) only

74. Unix command to change the case of first three lines of file "shortlist" from lower to upper

(1) $ tr '[a – z]' '[A – Z]' shortlist ¦ head-3
(2) $ head-3 shortlist ¦ tr '[a – z]' '[A – Z]'
(3) $ tr head -3 shortlist '[A – Z]' '[a – z]'
(4) $ tr shortlist head -3 '[a – z]' '[A – Z]'

75. Match the following vi commands in Unix :

List – I		**List – II**
a.	: w	i. saves the file and quits editing mode
b.	: x	ii. escapes unix shell
c.	: q	iii. saves file and remains in editing mode
d.	: sh	iv. quits editing mode and no changes are saved to the file

Codes :

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

Space For Rough Work