

Paper – II
Computer Science and Applications

Booklet Code

A

TEST BOOKLET NO.

Subject Code : **1 0**

Roll No. :

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(Figures as per admission card)

Roll No. (in words) : _____

OMR Sheet No. :

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Name and Signature of Invigilator/s

Signature : _____

Name : _____

Time : 2 Hours

Maximum Marks : 200

Number of Pages in this Booklet : 24

Number of Questions in this Booklet : 100

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of hundred (100) multiple-choice type of questions.
3. At the commencement of examination, the test 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 Test Booklet, tear off the paper seal on the edge of the cover page. Do not accept a booklet without sticker seal or 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 Test Booklet will be replaced nor any extra time will be given.**
 - (iii) After the verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
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 : (A) (B) (C) (D)

where (C) is the correct response.
5. Your responses to the questions are to be indicated in the **OMR Sheet kept inside this Booklet**. If you mark at any place other than in the circles, the OMR Sheet will not be evaluated.
6. Read the instructions given in OMR Sheet carefully. Fill the Booklet Code of Paper – II in OMR Sheet **Compulsorily**.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space provided for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. You have to return the OMR Answer Sheet to the invigilators at the end of the examination compulsorily and must NOT carry it with you outside the Examination Hall.
10. You can take away test booklet and carbon copy of OMR Answer Sheet after the examination.
11. **Use only Blue/Black Ball point pen.**
12. **Use of any calculator, electronic gadgets or log table, etc. is prohibited.**
13. **There is no negative mark for incorrect answer.**

COMPUTER SCIENCE AND APPLICATIONS**Paper – II**

1. Which of the following relational query languages have the same expressive power ?
- Relational Algebra
 - Tuple relational calculus restricted to safe expressions
 - Domain relational calculus restricted to safe expressions
- (A) II and III only
(B) I and II only
(C) I and III only
(D) I, II and III
2. Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock ?
- 2-phase locking
 - Time-stamp ordering
- (A) I only (B) II only
(C) Both I and II (D) Neither I nor II
3. Which of the following are relevant to database systems ?
- Intension and extension parts
 - Normalization
 - Database constraints
 - Concurrency mechanism
- (A) ii, iii and iv
(B) i, ii and iii
(C) i, iii and iv
(D) i, ii, iii and iv
4. Consider the transactions T1, T2 and T3 and the schedules S1 and S2 given below :
- T1 : r1(X); r1(Z); w1(X), w1(Z)
T2 : r2(Y); r2(Z); w2(Z)
T3 : r3(Y); r3(X); w3(Y)
- S1 : r1(X); r3(Y); r3(X); r2(Y); r2(Z); w3(Y); w2(Z); r1(Z); w1(X); w1(Z)
S2 : r1(X); r3(Y); r2(Y); r3(X); r1(Z); r2(Z) w3(Y); w1(X); w2(Z); w1(Z)
- Here r and w denote read and write operations on data items X, Y and Z. Which one of the following statements about the schedules is TRUE ?
- (A) Only S1 is conflict-serializable
(B) Only S2 is conflict-serializable
(C) Both S1 and S2 are conflict-serializable
(D) Neither S1 nor S2 is conflict-serializable
5. Match the elements of List – 1 with that of List – 2.
- | List – 1 | List – 2 |
|-----------------|-----------------------------|
| a. RAID 0 | i. Bit interleaved parity |
| b. RAID 1 | ii. Non redundant stripping |
| c. RAID 2 | iii. Mirrored disks |
| d. RAID 3 | iv. Error correcting codes |
- | | a | b | c | d |
|-----|----------|----------|----------|----------|
| (A) | iv | i | ii | iii |
| (B) | iii | iv | i | ii |
| (C) | iii | i | iv | ii |
| (D) | ii | iii | iv | i |

6. Consider the following Assertion and Reason and choose the correct option.

Assertion (A) : Neural Networks help in building predictive models based on huge data sets.

Reason (R) : Back propagation is one of the techniques used to train an Artificial Neural Network.

- (A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 (B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (C) (A) is correct but (R) is incorrect
 (D) (A) is incorrect but (R) is correct
7. Apple's Siri app is a voice-controlled digital virtual assistant capable of processing certain voice commands to make to-do lists, place online orders, schedule reminders and answer queries through internet searches. Siri uses which of the following technology ?
 (A) Decision Tree
 (B) NLP
 (C) Classification
 (D) Data Visualization

8. Consider the following Assertion and Reason and choose the correct option.

Assertion (A) : To some extent, interacting with an NLP-enabled machine is similar to conversing with a person.

Reason (R) : NLP employs algorithms to process natural language constructs such as speech and text.

- (A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 (B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (C) (A) is correct but (R) is incorrect
 (D) (A) is incorrect but (R) is correct

9. Which of the following are the requirements for knowledge representation system in artificial intelligence ?

- a. Representational accuracy
 b. Inferential adequacy
 c. Coverage adequacy
 d. Inferential efficiency
 e. Acquisition efficiency

(A) c, d, e

(B) a, b, c

(C) a, b, d, e

(D) b, c, d, e

10. Choose the correct match between List – 1 and List – 2 items :

List – 1

List – 2

- | | |
|----------------------------|--|
| a. Artificial Intelligence | i. Digital Ledger of Transactions |
| b. Machine Learning | ii. Huge and/or Complex |
| c. Big Data | iii. Algorithms and Statistical Models |
| d. Blockchain | iv. Intelligent Agents |

a b c d

- (A) iv iii ii i
 (B) iii iv i ii
 (C) iii iv ii i
 (D) i ii iii iv

11. Consider the following Assertion (A) and the Reason (R) and choose the correct option.

Assertion (A) : The spiral model is called a Meta-Model.

Reason (R) : It subsumes all the other SDLC models like Iterative model, classical waterfall model, prototyping model and evolutionary model.

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (C) (A) is true but (R) is false
 (D) (A) is false but (R) is true
12. Which of the following is a major drawback of the Spiral Model of Software Development ?
- (A) It involves a higher effort toward risk analysis
 (B) It doesn't work well for smaller software development projects
 (C) Here additional product features are added later on
 (D) Comprehensive approval and documentation control are required

13. Choose the option indicating correct match software quality context.

- a. Operation quality factor i. Efficiency
 b. Revision quality factor ii. Maintainability
 c. Transition quality factor iii. Reusability

a b c

- (A) i ii iii
 (B) iii ii i
 (C) ii i iii
 (D) i iii ii

14. Which of the following is/are considered option(s) for achieving reliable cost and effort estimation ?

- i. Use relatively simple decomposition techniques to generate project cost and effort estimates.
 ii. Using the estimates of similar completed projects as base.
 iii. The ability to translate the size estimate into human effort and calendar time.
 iv. Using an empirical models for software cost and effort estimation.

(A) i, ii and iii (B) ii and iii

(C) i, ii and iv (D) i, ii, iii and iv

15. Which of the following concepts are taken into account while making a choice between competing software development life-cycle model ?

- (A) Development Platform, Development Schedule
 (B) Client Population, Client Platform
 (C) Client profile and Economic Standing, Performance Criteria
 (D) Development Group Expertise, Problem Characteristics, User Expectations

16. Choose the option denoting correct match between List – 1 and List – 2 items :

List – 1

List – 2

- a. 1974 i. WWW
 b. 1991 ii. Google
 c. 1998 iii. ISO-OSI
 d. 1984 iv. TCP

a b c d

- (A) i ii iii iv
 (B) iv iii ii i
 (C) i iii ii iv
 (D) iv i ii iii

17. Consider the following statements in context of Shannon Hartley theorem and choose the correct option(s).

- I. The theorem talks of a maximum limit on channel capacity.
- II. The theorem states that the channel capacity does not become infinite with infinite bandwidth.
- III. The theorem talks of a trade-off between bandwidth and signal to noise ratio.

- (A) II and III only
- (B) I and II only
- (C) I and III only
- (D) I, II and III

18. Choose the option indicating correct match :

List – 1	List – 2
a. Broadcast	i. One-to-one
b. Unicast	ii. One-to-many
c. Multicast	iii. Many-to-many

- | | a | b | c |
|-----|-----|-----|-----|
| (A) | ii | i | iii |
| (B) | iii | ii | i |
| (C) | ii | iii | i |
| (D) | i | ii | iii |

19. Consider the Assertion (A) and Reason (R) and choose the correct option :

Assertion (A) : Piggybacking makes the better use of available channel bandwidth.

Reason (R) : In Piggybacking the data and acknowledgement are sent in the same frame.

- (A) Both (A) and (R) are true and (R) is not the correct explanation of (A)
- (B) Both (A) and (R) are true but (R) is the correct explanation of (A)
- (C) (A) is true, but (R) is false
- (D) (A) is false, but (R) is true

20. Choose the correct match of List – 1 and List – 2 items :

List – 1 (Port Number)	List – 2 (Use)
a. 23	i. World Wide Web
b. 25	ii. Remote Login
c. 80	iii. USENET News
d. 119	iv. E-mail

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

21. In literature, the Banker's algorithm is characterised as a deadlock avoidance approach. In this light, which of the following statement(s) are correct about its working ?

- i. It tries to avoid a deadlock but does not preclude the deadlock.
- ii. It ensures that a deadlock does not occur.
- iii. It does not allow the system to enter in to unsafe state.

(A) ii and iii (B) Only i
(C) Only ii (D) Only iii

22. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6 respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm ? Do not count the context switches at time zero and at the end.

- (A) 4
(B) 3
(C) 2
(D) 1

23. Which of the following concepts/activities are linked to compilation process ?

- i. Syntax directed translation
- ii. Garbage collection
- iii. Fragmentation
- iv. Code optimization
- v. Lexical analysis

(A) i, iii, v (B) i, iv, v
(C) i, ii, iii, iv (D) i, iii, iv, v

24. Which of the following are functions of a general loading scheme ?

- i. Allocation
- ii. Linking
- iii. Relocation
- iv. Loading
- v. Defragmentation
- vi. Garbage collection

(A) ii, iii, v
(B) iii, iv, vi
(C) i, ii, iii, iv
(D) i, iii, iv, vi

25. What do you call the situation when the result of a computation depends on the relative speeds of the processes competing for shared resource(s) ?

- (A) Cycle stealing
(B) Race condition
(C) Belady's anomaly
(D) An unsafe state with a deadlock

26. Match the following items of List – 1 and List – 2 in respect of algorithm paradigms :

List – 1

List – 2

- | | |
|----------------------------------|-------------------------|
| 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. Backtracking |

	a	b	c	d
(A)	III	I	II	IV
(B)	II	I	IV	III
(C)	II	I	III	IV
(D)	III	II	I	IV

27. 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 sequence of keys will be the result of an inorder traversal of the tree T ?

- (A) 3, 4, 5, 7, 9, 14, 20, 18, 17, 16, 15
 (B) 20, 18, 17, 16, 15, 14, 3, 4, 5, 7, 9
 (C) 20, 18, 17, 16, 15, 14, 9, 7, 5, 4, 3
 (D) 3, 4, 5, 7, 9, 14, 15, 16, 17, 18, 20

28. Which of the following statement(s) is/are true ?

- I. A hash function takes a message of arbitrary length and generates a fixed length code.
 II. A hash function takes a message of fixed length and generates a code of variable length.
 III. A hash function may give the same hash value for distinct messages.

- (A) Only I
 (B) II and III
 (C) I and III
 (D) Only II

29. What is the number of conditions that need(s) to be met for an NP Complete problem to be polynomially reducible ?

- (A) Five (B) Two
 (C) Three (D) Not fixed

30. How many steps are required to prove that a decision problem is NP Complete ?

- (A) Four
 (B) Three
 (C) Two
 (D) Varies from problem to problem

31. Choose the correct match between List – 1 and List – 2 items :

List – 1

List – 2

- | | |
|----------------------|--|
| a. Physical layer | i. Allow resources to network access |
| b. Datalink layer | ii. Move packets from one destination to other |
| c. Network layer | iii. Process to process message delivery |
| d. Transport layer | iv. Transmission of bit stream |
| e. Application layer | v. Formation of frames |

a b c d e

- (A) iv v ii iii i
 (B) v iv i ii iii
 (C) i iii ii v iv
 (D) i ii iv iii v

32. Choose the option indicating correct matching between List – 1 and List – 2 items :

List – 1**List – 2**

- | | |
|------------------------|-------------------|
| i. Co-axial cable | a. Guided media |
| ii. Twisted pair cable | b. Unguided media |
| iii. Optical fibre | |

i ii iii

- (A) b a b
 (B) b b b
 (C) a a a
 (D) a b a

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

- i. CDMA yields high data rates.
 ii. FDMA transfers data as continuous signal.
 iii. TDMA has very high flexibility.
 iv. TDMA is asynchronous.

- (A) i, ii and iii
 (B) ii, iii and iv
 (C) i, iii and iv
 (D) i and ii

34. Read the Assertion and the Reason and choose the correct answer :

Assertion (A) : The internet is a collection of interconnected networks, linked through various type of transmission media.

Reason (R) : World Wide Web is a web like collection of interconnected documents.

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (C) (A) is true but (R) is false
 (D) (A) is false but (R) is true

35. Read the Assertion and the Reason and choose the correct answer :

Assertion (A) : Intranet is a private version of the Internet.

Reason (R) : An intranet is a private network for sharing computing resources and information within an organisation, and it uses the Internet protocols.

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (C) (A) is true but (R) is false
 (D) (A) is false but (R) is true

36. Choose the option describing the correct match between concepts and their best possible descriptions.

Concept	Description
i. Inheritance	a. A function which is automatically called when an object is created
ii. Overloading	b. Allows to define a class to have properties of another class
iii. Friend	c. Non-member function access to the private parts of an object
iv. Constructor	d. Defining set of similar functions

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

37. Consider the following Assertion and Reason and choose the correct explanation.

Assertion (A) : Javascript has dynamic typing.

Reason (R) : Javascript verifies the type safety of a program at runtime.

- (A) Both (A) and (R) are true and (R) is the correct explanation for (A)
 (B) Both (A) and (R) are true but (R) is not the correct explanation for (A)
 (C) (A) is true but (R) is false
 (D) (A) is false but (R) is true

38. Which of the following feature(s) of C++ is/are used for late binding ?

- i. Virtual functions
 ii. Constructor and destructor
 iii. Function overloading

- (A) Only i (B) i and ii
 (C) ii and iii (D) i, ii and iii

39. In C++ programming language, which of the following feature is used to realize the run time polymorphism ?

- (A) Friend function
 (B) Function overriding
 (C) Inline function
 (D) Function with argument

40. What is the output of the following "C" code ?

```
#include<stdio.h>
union ex{
    inta, b, c;
};
intmain() {
    union ex u1;
    u1.a = 30;
    u1.b = 50;
    u1.c = u1.a + u1.c;
    printf("%d, %d, %d", u1.a, u1.b, u1.c);
    return 0;
}
```

- (A) 30, 50, 80 (B) 50, 50, 100
 (C) 30, 50, 100 (D) 100, 100, 100

41. Finite state automata can be defined with or without output.

Assertion (A) : A DFA with output can be constructed to complement digits of machine/binary language.

Reason (R) : A Mealy machine gives the output in transition from one state to another state.

Which of the following is true ?

- (A) Both statement (A) and (R) are true and (R) is correct explanation of (A)
- (B) Both statement (A) and (R) are true but (R) is not correct explanation of (A)
- (C) (A) is true but (R) is false
- (D) (A) is false but (R) is true

42. Match all items in List – 1 with correct options from those given in List – 2.

List – 1

- a. Regular expression
- b. Pushdown automata
- c. Dataflow analysis
- d. Register allocation

List – 2

- 1. Syntax analysis
- 2. Code generation
- 3. Lexical analysis
- 4. Code optimization

a b c d

- (A) 4 1 2 3
- (B) 3 1 4 2
- (C) 3 4 1 2
- (D) 2 1 4 3

43. Consider a grammar which has no empty production and no unit-production. Which of the following is the count of maximum reduction moves a bottom-up parser takes to parse a string with 'n' tokens ?

- (A) $n - 1$ (B) 2^n
- (C) $n/2$ (D) 2^n

44. Consider the following productions of LR(1) grammar.

$X \rightarrow c.X, c/d$

$X \rightarrow .cX, c/d$

$X \rightarrow .d, c/d$

$X \rightarrow c.X, \$$

$X \rightarrow .cX, \$$

$X \rightarrow .d, \$$

Which of the following statements related to merging of the two sets in the corresponding LALR parser is/are false ?

- i. Can be merged but will result in R-R conflict.
- ii. Cannot be merged since goto on c will lead to two different sets.
- iii. Cannot be merged since look aheads are different.
- iv. Can be merged but will result in S-R conflict.

- (A) only i
- (B) only ii
- (C) i and iv
- (D) i, ii, iii and iv

45. Dynamic linking is performed during the run time by placing the name of a shareable library in the executable image.

Assertion (A) : In dynamic linking, there are fewer chances of errors and failures.

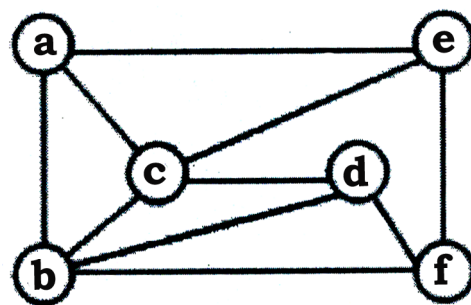
Reason (R) : It requires less memory space as multiple programs can share a single copy of the library.

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- (C) (A) is true but (R) is false
- (D) (A) is false but (R) is true
46. Let P , Q and R be finite sets and $X = (P - (P \cap R)) - (P - Q)$ and $Y = (P \cap Q) - (Q \cap R)$. Which one of the following is true ?
- (A) $X \subset Y$
- (B) $X = Y$
- (C) $X \supset Y$
- (D) $X - Y \neq \varnothing$ and $Y - X \neq \varnothing$

47. A number is selected randomly in the range 1 to 100. What is the probability that the selected number is divisible by 3 or 7 ?

- (A) 0.48
- (B) 0.43
- (C) 0.86
- (D) 0.66

48. What is the chromatic number of the below given graph ?



- (A) 6
- (B) 4
- (C) 3
- (D) 2
49. Let G be a group of order 20 and S be a subgroup of G such of order 4. Which one of the following options is correct in the given situation ?
- (A) Both G and S may not be cyclic
- (B) G is always cyclic, but S may not be cyclic
- (C) G may not be cyclic, but S is always cyclic
- (D) Both G and S are always cyclic

50. Let $G = (V, E)$ be a directed graph, where V is the set of vertices and E is the set of edges. Then which one of the following graphs has the same strongly connected components as G ?

- (A) $G_1 = (V, E_1)$ where $E_1 = \{(u, v) | (v, u) \in E\}$
- (B) $G_2 = (V_1, E)$ where V_1 is the set of vertices in G which are not isolated
- (C) $G_3 = (V, E_2)$ where $E_2 = \{(u, v) | \text{there is a path of length } < 2 \text{ from } u \text{ to } v \text{ in } E\}$
- (D) $G_4 = (V_2, E)$ where V_2 is the set of vertices in G which are not isolated

51. Arrange the following Cohesion types from worst to best, and so on.

1. Logical Cohesion
 2. Sequential Cohesion
 3. Communication Cohesion
 4. Temporal Cohesion
 5. Procedural Cohesion
- (A) $1 \rightarrow 5 \rightarrow 4 \rightarrow 2 \rightarrow 3$
- (B) $1 \rightarrow 4 \rightarrow 5 \rightarrow 3 \rightarrow 2$
- (C) $2 \rightarrow 5 \rightarrow 1 \rightarrow 4 \rightarrow 3$
- (D) $2 \rightarrow 5 \rightarrow 3 \rightarrow 4 \rightarrow 1$

52. Match the following :

List – 1

List – 2

- | | |
|--------------------------------|---|
| a. Waterfall model | i. Specification can be developed incrementally |
| b. Evolutionary model | ii. Requirements compromises are inevitable |
| c. Component-based development | iii. Berry B. Boehm |
| d. Spiral model | iv. Winston Walker Royce |

a b c d

- (A) iv i ii iii
- (B) i iii iv ii
- (C) iv iii i ii
- (D) ii iii i iv

53. When multiple modules have read and write access to some global data, it is called

- (A) Content coupling
- (B) Stamp coupling
- (C) Data coupling
- (D) Common coupling

54. Continuous and constant communication among the team members, managers and the customers is emphasized by

- (A) Structured Programming
- (B) Extreme Programming
- (C) Aspect Oriented Software Development
- (D) Component Based Development

55. In a good software design, cohesion refers to the degree to which the elements of a module belong together.

Assertion (A) : Modules with high cohesion are preferable.

Reason (R) : Keeping parts of a code base that are related to each other in a single place gives better designed code that is easier to maintain.

- (A) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (B) (A) is true but (R) is false
 (C) (A) is false but (R) is true
 (D) Both (A) and (R) are true and (R) is the correct explanation of (A)

56. Choose the option indicating correct match.

- | | |
|---------------------------|----------------------------------|
| a. Cache memory | i. Static random access memory |
| b. Higher packing density | ii. Dynamic random access memory |
| c. Higher speed | |
| d. Cheaper | |

a b c d

- (A) i ii i ii
 (B) i i ii ii
 (C) ii ii i i
 (D) ii i ii i

57. Consider the following Assertion and Reason and choose the correct option.

Assertion (A) : Boolean expressions can be easily simplified using Karnaugh map.

Reason (R) : Karnaugh map can be drawn for minterms as well as maxterms.

- (A) (A) is false, (R) is true
 (B) (A) is true, (R) is false
 (C) Both (A) and (R) are correct and (R) is correct explanation of (A)
 (D) Both (A) and (R) are correct but (R) is not correct explanation of (A)

58. Consider the following Assertion and Reason and choose the correct option.

Assertion (A) : Only Data hazard cause delays in the pipeline.

Reason (R) : Data hazards occur when instructions that exhibit data dependence, modify data in different stages of a pipeline.

- (A) (A) is true, (R) is false
 (B) (A) is false, (R) is true
 (C) Both (A) and (R) are correct and (R) is correct explanation of (A)
 (D) Both (A) and (R) are correct but (R) is not correct explanation of (A)

59. Match each of the high level language statements given on the left hand side with the most natural addressing mode from those listed on the right hand side.

- a. $A[1] = B[J];$ I. Indirect addressing
 b. $\text{while } [*A++];$ II. Indexed addressing
 c. $\text{int temp} = *x;$ III. Auto increment

a b c

- (A) III II I
 (B) I III II
 (C) II III I
 (D) I II III

60. Choose the correct matching of List – 1 items with List – 2 items.

List – 1

List – 2

- a. Handshaking I. I/O interface informs the CPU that device is ready for transfer
 b. Programmed I/O II. Requires two control signals working in opposite directions
 c. Interrupt initiated I/O III. Has local memory and control large set of I/O devices
 d. I/O processor IV. Requires CPU to check the I/O flag and perform transfer

a b c d

- (A) II IV I III
 (B) II III I IV
 (C) III IV II I
 (D) III IV I II

61. How many states are required to construct a Deterministic Finite State Automata for input symbols Σ (a, b) of length 'n' ?

- (A) n
 (B) $n + 1$
 (C) $n - 1$
 (D) $n + 2$

62. Which of the following geometric shape is used to denote the final state in the construction of a Finite State Automaton ?

- (A) Circle
 (B) Rectangle
 (C) Doubled Lined Circle
 (D) Diamond

63. Which option describes the language generated by following grammar G ?

$G = (\{x, y\}, \{s, x, y\}, p, s)$ and productions

$S \rightarrow xy$

$S \rightarrow yx$

$x \rightarrow xz$

$x \rightarrow x$

$y \rightarrow y$

$z \rightarrow z$

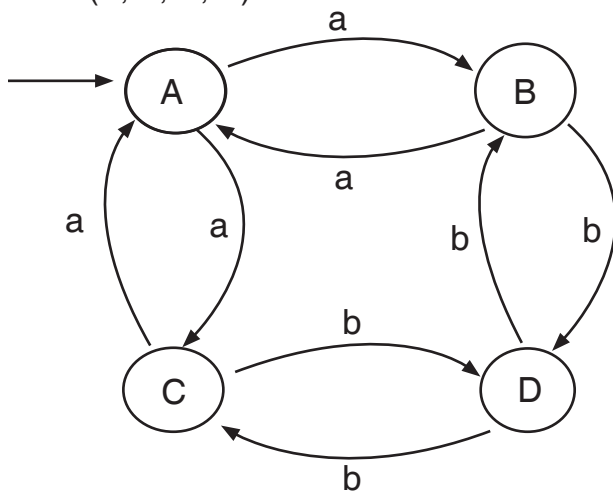
- (A) Chomsky Type 3
 (B) Chomsky Type 2
 (C) Chomsky Type 1
 (D) Chomsky Type 0

64. Which of the following statement(s) is/are true ?

- i. The language $L = \{a^{10}\}$ is regular
- ii. The language $L = \{a^n : n \text{ is prime}\}$ is regular
- iii. The language $L = \{a^n b^n : n \geq 1\}$ is regular
- iv. The language $L = \{a^n b^n : n = 5\}$ is regular

- (A) i, ii, iii and iv (B) i, ii and iii
(C) ii, iii and iv (D) i and iv

65. Consider the following four-state (A, B, C, D) DFA.



Which of the following statement is true ?

- (A) State A accept even number of 'a' and odd number of 'b'
- (B) State B accept even number of 'a' and even number of 'b'
- (C) State C accept odd number of 'a' and odd number of 'b'
- (D) State D accept odd number of 'a' and odd number of 'b'

66. Which of the following are the drawbacks of using file systems that the database approach has targeted to overcome ?

- i. Data redundancy and inconsistency
- ii. Difficulty in accessing data
- iii. Data isolation
- iv. Integrity problems

- (A) i, ii, iii and iv
(B) i and iv
(C) i, ii and iii
(D) Only i

67. Match the elements of List – 1 and List – 2.

List – 1

- a. Classification
- b. Clustering
- c. Feature extraction
- d. Feature selection

List – 2

- I. Principal component analysis
- II. Branch and bound
- III. K-nearest neighbour
- IV. K-means

a b c d

- (A) III IV II I
(B) IV III I II
(C) III IV I II
(D) IV III II I

68. In concurrency control context let T1 and T2 be two concurrent transactions. Consider the following sequence of operations on data element X.

T1 : Read (X) T1 : Write (X)

T2 : Read (X) T2 : Write (X)

Which of the following best describes the situation ?

- (A) Incorrect summary
- (B) Lost update
- (C) Dirty read
- (D) Unrepeatable read

69. Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R). Read the statements and choose the correct answer.

Assertion (A) : Normalization is an important technique for organizing data in databases.

Reason (R) : It helps to control the data redundancy i.e. duplicity of the data in databases.

- (A) Both (A) and (R) are true and (R) is the correct explanation of A
- (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- (C) (A) is false but (R) is true
- (D) Both (A) and (R) are false

70. Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R). Read the statement and choose the correct answer using the code given below.

Assertion (A) : We declare an attribute or a group of attributes as a relation key.

Reason (R) : The relation key identifies the tuples of a relation uniquely.

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- (C) (A) is false but (R) is true
- (D) Both (A) and (R) are false

71. Choose the option indicating correct match.

- | | |
|------------------------------|------------------------|
| a. No. of edges in the graph | i. Null graph |
| b. Empty edge set | ii. Order of the graph |
| c. Graph having one node | iii. Size of the graph |
| d. No. of nodes in a graph | iv. Trivial graph |

a b c d

- (A) i ii iv iii
- (B) ii i iii iv
- (C) iv iii ii i
- (D) iii i iv ii

72. Which of the following statement(s) hold true in context of undirected graphs ?

1. Sum of degrees of all vertices is even.
2. Number of odd degree vertices is even.
3. Edges have no direction.

- (A) 1 and 2 only
(B) 2 and 3 only
(C) Only 3
(D) 1, 2 and 3

73. Consider the following first-order logic sentence.

$$S : \forall x (\exists y R(x, y))$$

Assuming non-empty logical domains, which of the sentences below are implied by S ?

1. $\exists y (\exists x R(x, y))$
2. $\exists y (\forall x R(x, y))$
3. $\forall y (\exists x R(x, y))$
4. $\sim \exists x (\forall y R(x, y))$

- (A) Only 4
(B) 1 and 4
(C) Only 2
(D) 2 and 3

74. G is a connected weighted undirected graph. Consider the following two statements.

I : There exists a minimum weight edge in G which is present in every minimum spanning tree of G.

II : If every edge in G has distinct weight, then G has a unique minimum spanning tree.

Which one of the following options is correct ?

- (A) Both I and II are true
(B) I is true and II is false
(C) I is false and II is true
(D) Both I and II are false

75. Consider the following two statements I and II.

I : There exist random variables P and Q such that

$$(E[(P - E(P))(Q - E(Q))])^2 > \text{Var}[P] \text{Var}[Q]$$

II : For all random variables P and Q,

$$\text{Cov}[P, Q] = E[|P - E[P]| |Q - E[Q]|]$$

Which one of the following choices is correct ?

- (A) Both I and II are false
(B) Both I and II are true
(C) I is true, but II is false
(D) I is false, but II is true

76. What is the maximum number of parentheses that will appear on the stack at any time during evaluation of following parentheses expression ?

(((()) (())))

- (A) 2
- (B) 3
- (C) 4
- (D) 5

77. Consider the following statements in relation to priority queue :

- I. It is a special type of queue in which each element is associated with a priority value.
- II. It is used in round robin process scheduling algorithm.

Which of the following is correct ?

- (A) Both (I) and (II) are incorrect
- (B) (I) is correct and (II) is incorrect
- (C) (I) is incorrect and (II) is correct
- (D) Both (I) and (II) are correct

78. Identify the “queue full” condition in case of double ended queue.

- (A) If ((front = 0 && rear = max - 1) || (front = rear + 1))
- (B) If (front = 0 && rear = max - 1)
- (C) If (front = - 1 && rear = - 1)
- (D) If (rear = max - 1)

79. Linked lists is very flexible linear data structure, but it is not suitable for which of the following operation ?

- (A) Polynomial manipulation
- (B) Binary search
- (C) Insertion sort
- (D) Radix sort

80. Consider two strings A = “rprqq” and B = “prpqrqp”. Let c be the length of the Longest Common Subsequence (LCS) between A and B and let d be the number of such longest common subsequences between A and B. Then calculate the value of (c + 10d = ?).

- (A) 43
- (B) 34
- (C) 57
- (D) 23

81. Which of the following statement(s) is/are true ?

- a. The truth value of fuzzy set is between 0 and 1.
- b. The truth value of fuzzy set is either 0 or 1.
- c. The truth value of sets in traditional set theory is between 0 and 1.
- d. The truth value of sets in traditional set theory is either 0 or 1.

- (A) a, c
- (B) a, d
- (C) b, c
- (D) b, d

82. Which of the following statement(s) is/are true for A* algorithm ?

S1 : A* algorithm provides optimal and complete solution.

S2 : A* algorithm provides best solution.

S3 : A* algorithm provides optimal solution.

S4 : A* algorithm provides accurate solution.

(A) S1, S4

(B) S1, S2

(C) S3, S2

(D) S4, S2

83. Which of the following inference is Modus Ponens ?

(A) $P \rightarrow Q, P \vdash Q$

(B) $P \rightarrow Q, \sim Q \vdash \sim P$

(C) $P \rightarrow Q, \sim P \vdash \sim Q$

(D) $P \rightarrow Q, Q \vdash \sim P$

84. STRIPS is an action-centric representation which, for each action, specifies when the action can occur and the effects of the action. It is related to which of the following ?

i. SHAKEY

ii. Stanford Research Institute

iii. Robotics

iv. Artificial Intelligence

(A) i, ii and iii only

(B) ii, iii and iv only

(C) i, ii and iv only

(D) i, ii, iii and iv

85. Choose the correct Match of List – 1 and List – 2 items :

List – 1

List – 2

a. MYCIN

i. Expert systems

b. User-interface

ii. Comprises facts/rules about the domain

c. Prolog

iii. Non-procedural, declarative language

d. Knowledge base

iv. Permits the user to communicate with the system

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

86. Which of the following is a process of converting vector image to bitmap image ?

(A) 2D transformation

(B) Quantization

(C) Pixelation

(D) Rasterization

87. Which of the following is the best description of the aspect ratio ?

(A) It is the ratio of height to width measured in no. of pixel

(B) It is the ratio of width to depth measured in no. of pixel

(C) It is the ratio of width to height measured in no. of units

(D) It is the ratio of depth to width measured in no. of units

88. Choose the correct option that describe group of correct statement(s).

- a. In ambient illumination the light source is indirect.
- b. Illumination model is used to calculate the intensity of light that is reflected at given point on the surface.
- c. In specular reflection the brightness of a point depends upon the angle made by the light source and surface.
- d. Diffuse reflection occurs on the rough or grainy surfaces.

- (A) a and b
- (B) a, b and d
- (C) Only b
- (D) a, b and c

89. Which of the following coordinate pairs represents the first four point plots on the line AB with A(0, 0) and B (8, 4) using DDA line drawing algorithm ?

- (A) (0, 0), (1, 1.5), (2, 2), (3, 2)
- (B) (0, 0), (1, 1), (2, 2), (3, 2)
- (C) (0, 0), (1, 2), (2, 1) (2, 3)
- (D) (0, 0), (1, 1), (2, 1), (3, 2)

90. Which of the following statement(s) is/are correct with reference to computer graphics ?

- I. Object size can be changed using scaling transformation.
- II. Bezier curves are generated using the concepts of approximation.
- III. Sheer transformation slants the shape of an object.
- IV. Scaling is also termed as skewing.

- (A) I, II and IV
- (B) II and III
- (C) I and II
- (D) I, II and III

91. Consider a system having 'm' resources of same type. These resources are shared by 3 processes A, B and C that have peak demands of 3, 4 and 6 respectively. For what value of 'm' deadlock will not occur ?

- (A) 9
- (B) 10
- (C) 13
- (D) 7

92. Match the List – 1 and List – 2 element in LINUX/UNIX file system context.

List – 1

- a. Boot block
- b. Super block
- c. iNode table
- d. Data block

List – 2

- I. Information about file system
- II. Information about file
- III. Storage space
- IV. Code for making OS ready

a b c d

- (A) I III II IV
- (B) IV I II III
- (C) III I II IV
- (D) IV II I III

93. 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 give the correct number of page faults for LRU, FIFO and Optimal page replacement algorithms respectively ? Assume an availability of 5 page frames and all frames are initially empty.

- (A) 10, 14, 8
- (B) 8, 10, 7
- (C) 7, 10, 8
- (D) 7, 10, 7

94. Which of the following is not typically a benefit of dynamic linking ?

- I. Reduction in overall program execution time
- II. Reduction in overall space consumption in memory
- III. Reduction in overall space consumption on disk
- IV. Reduction in the cost of software updates

- (A) Only I
- (B) I and IV
- (C) II and III
- (D) Only IV

95. Some of the criteria for assigning a priority to a process are

- I. Processor utilization by an individual process
- II. Weight(s) assigned to a user or group of users
- III. Processor utilization by a user or group of processes

In fair share scheduler, priority is calculated based on

- (A) I and II
- (B) I and III
- (C) I, II and III
- (D) II and III

96. Let $m = (301)_4$ and $n = (101)_4$. What shall be the base 4 expansion of $m + n$?

- (A) $(635)_4$
- (B) $(32312)_4$
- (C) $(1002)_4$
- (D) $(21323)_4$

97. Which of the following is a combinatorial logic circuit which takes one single input data line and then switches it to any one of a number of individual output lines one at a time ?

- (A) Mux (B) Demux
- (C) Codec (D) Modem

98. Consider the following statements :

- i. In RISC processor instruction size is fixed.
- ii. In CISC instruction size is variable.
- iii. In CISC instruction modes are lesser than RISC.
- iv. In CISC all instructions are register-to-register except load and store instruction.

Choose the correct answer from the options given below.

- (A) i and ii only
- (B) iii and iv only
- (C) i, ii and iv only
- (D) i, ii, iii and iv

99. Which of the following is/are performance measure(s) of a pipelined processor ?

- i. Speed-up of pipeline
- ii. Efficiency of the pipeline
- iii. Width of the pipeline
- iv. Length of the pipeline
- v. Throughput of the pipeline

Which of the following is correct ?

- (A) i, ii and iii
- (B) i, iii and iv
- (C) iii, iv and v
- (D) i, ii and v

100. A computer is based on a 32-bit processor. Which of the following statement(s) is/are true for that processor ?

- i. It can use no more than 32 MB of memory.
- ii. It can address up to 4 GB memory.
- iii. It can use up to 32 GB of memory.

- (A) i and iii
- (B) Only i
- (C) Only ii
- (D) ii and iii

Space for Rough Work

Space for Rough Work

