



Paper - II

COMPUTER SCIENCE

Booklet Code

A

SUBJECT CODE : 1 0

Test Booklet No.

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

- Write your roll number in the space provided on the top of this page.
- This paper consists of hundred (100) multiple-choice type of questions.
- 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:**
 - 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.
 - 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.
 - 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.
- Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
Example : Ⓐ Ⓑ ● Ⓓ
where (C) is the correct response.
- 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.
- Read the instructions given in OMR Sheet carefully. Fill the Booklet Code of Paper-II in OMR Sheet **Compulsorily**.
- Rough Work is to be done in the end of this booklet.
- 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.
- 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.
- You can take away test booklet and carbon copy of OMR Answer Sheet after the examination.
- Use only Blue/Black Ball point pen.**
- Use of any calculator, electronic gadgets or log table, etc. is prohibited.**
- There is no negative mark for incorrect answer.**





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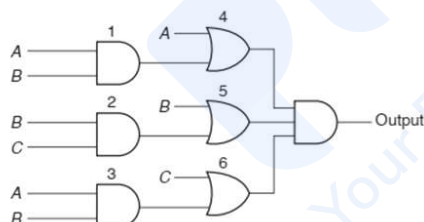
1. If A is a finite set with n elements, then number of elements in the largest equivalence relation of A is _____.

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

2. The circuit which will work as OR gate in positive level will work as ____ gate in negative level logic.

(A) NOR gate
 (B) NAND gate
 (C) Both NAND and NOR gate
 (D) AND gate

3. Find the function represented by the figure



(A) $A + B + C$
 (B) AB
 (C) $AB + C$
 (D) $B + C$

4. Every cut set of a connected Euler graph has _____.

(A) at least three edges
 (B) an odd number of edges
 (C) an even number of edges
 (D) no such characterisation

5. The number of integers between 1 and 250 that are not divisible by 2, 3, 5 or 7 is _____.

(A) 91
 (B) 32
 (C) 57
 (D) 84

6. Given below are two statements:

Statement 1: A graph is planar if it can be drawn in a plane so that no edges cross.

Statement 2 : Every planar graph has at least one vertex of degree 5 or less than 5.

Choose the most appropriate answer from the option given below :

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

7. The calculation of opportunity cost in the MODI method is analogous to a _____.

(A) $Z_j - C_j$ value for non- basic variable columns in the Simplex method
 (B) Value of a variable in X_B - column of the Simplex method
 (C) Variable in the B- column in the Simplex method
 (D) Duplex Method


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8. The pre-order traversal of a binary search tree is given by 12,8,6,2,7,9,10,16,15,19,17,20. Then the post order traversal of this tree is:

- (A) 2, 6, 7, 8, 9, 10, 12, 15, 16, 17, 19, 20
 (B) 2, 7, 6, 10, 9, 8, 15, 17, 20, 19, 16, 12
 (C) 7, 2, 6, 8, 9, 10, 20, 17, 19, 15, 16, 12
 (D) 7, 6, 2, 10, 9, 8, 15, 16, 17, 20, 19, 12

9. Match the following:

IC Family	GATE
TTL	NOR
CMOS	NOT
ECL	NAND

- (A) TTL:NAND; ECL:NOR; CMOS:NOT
 (B) TTL:NAND; ECL:NOT; CMOS:NOR
 (C) TTL:NOT; ECL:NAND; CMOS:NOR
 (D) TTL:NOR; ECL:NOT; CMOS:NAND
10. Given below are two statements:

Statement 1: When the processor finds a word in cache during a read operation, the main memory is involved in the transfer.

Statement 2: Cache coherence problems exist in multiprocessors with private caches because of the need to share writable data. Choose the most appropriate answer from the option given below:

- (A) Both statement I and statement II are correct

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

11. Increasing the RAM of a computer typically improved performance because_____.

- (A) Virtual memory increases
 (B) Page map table size decreases
 (C) Fewer page faults occur
 (D) Fewer segmentation faults occur

12. Which of the following is/are true of the auto-increment addressing mode?

1. It is used in creating self-relocating code.
 2. If it is included in an Instruction Set Architecture, then an additional ALU is required for effective address calculation.
 3. The amount of increment depends on the size of the data item accessed.

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



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13. Assuming all numbers are in 2's complement representation, which of the following numbers is divisible by 11111011?
- (A) 11100111
(B) 11100100
(C) 11010111
(D) 11011011
14. How many 3×8 decoders are needed to construct 4×16 decoder?
- (A) 2
(B) 4
(C) 3
(D) 24/64
15. The main difference between JK and RS flip-flop is _____.
- (A) JK flip-flop do not need a clock pulse where as RS flip-flop requires the same
(B) The output Q is connected to J and K is grounded whereas it is opposite in R and S
(C) JK flip-flop accepts both inputs as 1 whereas RS flip flop not
(D) JK flip-flop is acronym of Johnson-Kelth's multivibrator and RS of Reset-Set multivibrator
16. Register is a _____.
- (A) set of capacitors and inductors used to provide input instructions in a digital computer
(B) set of memory cells used to store the I/O data
(C) temporary storage unit within the CPU
(D) permanent storage unit within the CPU
17. Consider the following floating-point number representation.
- | | | | |
|----------|----|----------|---|
| 31 | 24 | 23 | 0 |
| Exponent | | Mantissa | |
- The exponent is in 2's complement representation and mantissa is in the sign magnitude representation. The range of the magnitude of the normalized numbers in this representation is _____.
- (A) 0 to 1
(B) 0.5 to 1
(C) 2^{-23} to 0.5
(D) 0.5 to $(1 - 2^{-23})$
18. When run on a given system, a program takes 1,000,000 cycles. If the system achieves a CPI of 40, how many instructions are executed in running the program?
- (A) 250
(B) 2500
(C) 25000
(D) 400

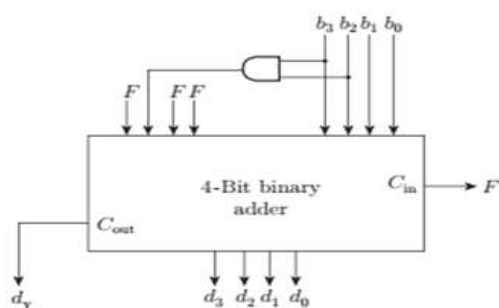


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19. Choose the incorrect one:

- (A) In immediate addressing mode, the operand is specified in the instruction explicitly.
- (B) In direct addressing mode, the operand is specified in the instruction explicitly.
- (C) In relative addressing mode, the content of program counter is added to the address part of instruction to obtain the effective address.
- (D) In implied addressing mode, the definition of the instruction itself specifies the operands implicitly.

20. Consider the circuit in the following figure which has a 4-bit binary number $b_3b_2b_1b_0$ as input and a 5-bit binary number $d_4d_3d_2d_1d_0$ as output, F as input stands for FALSE. The circuit implements :



- (A) Binary to Hex conversion
- (B) Binary to BCD conversion
- (C) Binary to grey code conversion
- (D) Binary to radix -12 conversion

21. A block of code to be executed with reference to a procedure call is determined at run time. This is known as :

- (A) Late binding
- (B) Method overriding
- (C) Static binding
- (D) Polymorphism

22. Give output of the following program?

```
void main()
{
    int i=5;
    printf("%d",i+++++i);
}
```

- (A) Compiler Error
- (B) 7
- (C) 8
- (D) 9

23. Consider the operation of addition. For two numbers the operation would produce a sum. For two strings, the same operation would produce a concatenated string of the first two. This feature is known as :

- (A) Polymorphism
- (B) Dynamic binding.
- (C) Encapsulation
- (D) Inheritance

24. $\text{int } x=2-3*4/5*6;$

What value will x contain in the sample code above?

- | | |
|--------|---------|
| (A) 10 | (B) -10 |
| (C) 11 | (D) -11 |



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25. Which one of the following statements is not correct?

- (A) Data mining helps to make useful predictions on new data and enables to take future decisions.
- (B) OLAP enables to present data in different views and in different Dimensions.
- (C) Product dimension table will store information about products.
- (D) Data Integration step in data mining merges the data from multiple homogeneous data sources.

26. The quality of an image displayed on a monitor depends on _____.

- (A) Frame buffer size
- (B) Aspect ratio
- (C) Color palette
- (D) Screen resolution

27. Dragging in computer graphics is performed using which transformation?

- (A) Reflection (B) Rotation
- (C) Scaling (D) Translation

28. 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 from the code given below :

Assertion (a) : Window to Viewport Transformation is the process of transforming 2D world-coordinate objects to device coordinates.

Reason (r) : A viewport is described by four world co-ordinates.

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

29. What is the difference between servlet and JSP?

- (A) Writing code of servlet is easier than JSP
- (B) Servlet is slower than JSP
- (C) Servlet is a JAVA code and JSP is a HTML based compilation code
- (D) All of the above

30. Which of the following statements is not correct?

- (A) Web applications are software used by web browsers
- (B) http is a language for website development
- (C) Internet is a global network of connected computers whereas World Wide Web are the pages you see when you are online
- (D) Web applications may use server-side logic or client-side logic



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31. Which is not a Data Model?

- (A) Relational Data Model
- (B) Entity—Relationship Data Model
- (C) Object-Based Data Model
- (D) Recursive Data model

32. The following table has two attributes A and C where A is the primary key and C is the foreign key referencing A with ON DELETE CASCADE.

A	C
2	4
3	4
4	3
5	2
7	2
9	5
6	4

What is the set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2, 4) is deleted?

- (A) (5, 2), (7, 2)
- (B) (5, 2), (7, 2), (9, 5)
- (C) (5, 2), (9, 5)
- (D) (2, 4), (7, 2)

33. Let E1 and E2 be two entities in an ER diagram with simple single-valued attributes. R1 and R2 are two relationships between E1 and E2, where R1 is one-to-many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. What is the minimum number of tables required to represent this situation in the relational model?

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

34. Consider the following relation schema pertaining to a student's database:

Student (Rollno, name, address)

Enroll (Rollno, courseno, coursenam)

Where the primary keys are shown underlined. The number of tuples in the student and Enroll tables are 120 and 6, respectively. What are the maximum and minimum number of tuples that can be present in (student * Enroll), Where '*' denotes natural join?

- (A) 6, 6
- (B) 6, 120
- (C) 120, 6
- (D) 120, 120


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35. A relational schema for a train reservation database is given below :

Passenger

Pid	P Name	Age
0	Sachin'	65
1	Rahul'	66
2	Sourav'	67
3	Anil'	69

Reservation

Pid	Class	Tid
0	AC	8200
1	AC	8201
2	SC	8201
5	AC	8203
1	SC	8204
3	AC	8202

What pid's are returned by the following SQL query for the above instance of the tables?

SELECT pid FROM Reservation WHERE class = 'AC' AND EXISTS(SELECT * FROM passenger WHERE age > 65 AND Passenger.pid = Reservation.pid) :

- (A) 0, 1
(B) 1, 3
(C) 1, 5
(D) 0, 3
36. Computational model based on the functioning of human brain and that learns from correct examples is called _____.

- (A) Decision trees
(B) Association rule model

- (C) Sequential pattern model
(D) Artificial neural network

37. To determine what products customers purchase together with other products is called _____.

- (A) Market basket analysis
(B) Regression analysis
(C) Prediction
(D) Classification

38. Select the correct alternative from the given choices :

Match the following:

I Empid	1 Multivalued
II Name	2 Derived
III Age	3 Composite
IV Contact No.	4 Unique

- (A) I – 4, II – 3, III – 2, IV – 1
(B) I – 3, II – 2, III – 4, IV – 1
(C) I – 2, II – 1, III – 4, IV – 3
(D) I – 1, II – 3, III – 2, IV – 4
39. Given the relation R(A, B, C, D) and the set $F = \{AB \rightarrow C, B \rightarrow D, D \rightarrow B\}$ find the candidate keys of the relation :

- (A) AB and CD
(B) ABCD
(C) BD and AB
(D) AB and AD



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40. Consider the set of relations shown below and the SQL query that follows :
- Students: (Roll_number, Name, Date_of_birth)
- Courses: (Course_number, Course_name, Instructor)
- Grades: (Roll_number, Course_number, Grade)
- SELECT distinct Name FROM Students, Courses, Grades WHERE Students.Roll_number = Grades.Roll_number and Courses.Instructor = Shyam and Courses.Course_number = Grades.Course_number and Grades.Grade = A
- Which of the following sets is computed by the above query?
- (A) Names of students who have got an A grade in all courses taught by Shyam
- (B) Names of students who have got an A grade in all courses
- (C) Names of students who have got an A grade in at least one of the courses taught by Shyam
- (D) Names of students who have got an A grade or taught by Shyam
41. Mutual exclusion problem occurs_____.
- (A) Between two disjoint processes that do not interact
- (B) Among processes that share resources
- (C) Among processes that do not use the same resource
- (D) Between two processes that uses different resources of different machines
42. If the disk is rotating at 3600 rpm, determine the effective data transfer rate which is defined as the number of bytes transferred per second between disk and memory. (Given size of track = 512 bytes)
- (A) 20 Kbps
- (B) 30 Kbps
- (C) 40 Kbps
- (D) 50 Kbps
43. 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 from the code given below:
- Assertion (a):** A virtual memory is another name for the address space in which a job operates under demand paging.
- Reason (r):** Segmentation is both a memory and an information management scheme.
- (A) Both (a) and (r) are true and (r) is correct explanation of (a)
- (B) Both (a) and (r) are true and (r) is not the correct explanation of (a)
- (C) (a) is true, but (r) is false
- (D) (a) is false, but (r) is true



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44. Consider the following statements with respect to user-level threads and kernel-supported threads :

- (i) Kernel-level threads are faster than user-level threads
- (ii) For user-level threads, a system call can block the entire process
- (iii) Kernel-supported threads can be scheduled independently
- (iv) User-level threads are transparent to the kernel

Which of the above statements are true?

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

45. Group 1 contains some CPU scheduling algorithms and Group 2 contains some applications. Match entries in Group 1 to entries in Group 2.

Group-I	Group-II
(P) Gang Scheduling	(1) Guaranteed Scheduling
(Q) Rate Monotonic Scheduling	(2) Real-time Scheduling
(R) Fair Share Scheduling	(3) Thread Scheduling

	P	Q	R
(A)	3	2	1
(B)	1	2	3
(C)	2	3	1
(D)	1	3	2

46. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many contexts 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) 1
- (B) 2
- (C) 3
- (D) 4

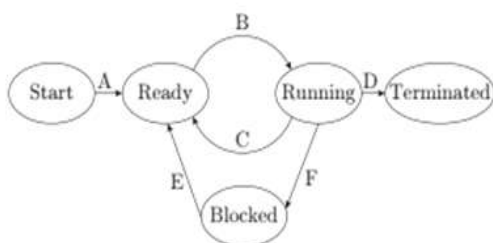
47. Which of the following is not true of deadlock prevention and deadlock avoidance schemes?

- (A) In deadlock prevention, the request for resources is always granted if the resulting state is safe
- (B) In deadlock avoidance, the request for resources is always granted if the result state is safe
- (C) Deadlock avoidance is less restrictive than deadlock prevention
- (D) Deadlock avoidance requires knowledge of resource requirements a priori



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48. In the following process state transition diagram for a uniprocessor system, assume that there are always some processes in the ready state :



Now, consider the following statements:

- I. If a process makes a transition D, it would result in another process making transition A immediately
 - II. A process P2 in blocked state can make transition E, while another process P1 is in running state
 - III. The OS uses pre-emptive scheduling
 - IV. The OS uses non-preemptive scheduling
- Which of the above statements are True?
- (A) I and II (B) I and III
(C) II and III (D) II and IV
49. Which of the following statements are true?
- I. Shortest remaining time first scheduling may cause starvation
 - II. Pre-emptive scheduling may cause starvation
 - III. Round robin is better than FCFS in terms of response time
- (A) only I (B) only I and III
(C) only II and III (D) I, II and III

50. A scheduling algorithm assigns priority proportional to the waiting time of a process. Every process starts with priority zero (the lowest priority). The scheduler re-evaluates the process priorities every T time units and decides the next process to schedule. Which one of the following is True if the processes have no I/O operations and all arrive at time zero?

- (A) This algorithm is equivalent to the First-come-first-serve algorithm
(B) This algorithm is equivalent to the Round-Robin algorithm
(C) This algorithm is equivalent to the Shortest-job-first algorithm
(D) This algorithm is equivalent to the Shortest-remaining-time-first algorithm

51. Match List-I and List-II and select the correct answer from the codes given below :

	List-I	List-II
P	Waterfall model	1 Specifications can be developed incrementally
Q	Evolutionary model	2 Requirements compromises are inevitable
R	Component-based software engineering	3 Explicit recognition of risk
S	Spiral development	4 Inflexible partitioning of the project into stages

Codes:

- | | | | | |
|-----|---|---|---|---|
| | P | Q | R | S |
| (A) | 1 | 2 | 3 | 4 |
| (B) | 4 | 1 | 2 | 3 |
| (C) | 4 | 2 | 1 | 3 |
| (D) | 3 | 1 | 2 | 4 |


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52. Which one of the following is True?

- (A) The requirements document also describes how the requirements that are listed in the document is implemented efficiently
- (B) Consistency and completeness of functional requirements are always achieved in practice
- (C) Prototyping is a method of requirements validation
- (D) Requirements review is carried out to find the errors in system design

53. A company needs to develop a strategy for software product development for which it has a choice of two programming language L1 and L2. The number of Lines Of Code (LOC) developed using L2 is estimated to be twice the LOC developed with L1, the product will have to be maintained for five years. Various parameters for the company are given in the table below.

Parameter	Language L ₁	Language L ₂
Man years needed for development	LOC/10000	LOC/10000
Development cost per year	Rs. 10,00,000	Rs 7,50,000
Maintenance time	5 years	5years
Cost of maintenance per year	Rs. 1,00,000	Rs 50,000

Total cost of the project includes cost of development and maintenance. What is the LOC for L1 for which the cost of the project using L1 is equal to the cost of the project using L2?

- (A) 4000
- (B) 5000
- (C) 4333
- (D) 4667

54. A company need to develop digital signal processing software for one of its newest inventions. The software is expected to have 4000 lines of code. The company needs to determine the effort in person-months needed to develop this software using basic COCOMO model.

The multiplicative factor — for this model — given as 2.8 for the software development on embedded systems. While the exponentiation factor is given as 1.20. What is the estimated effort in person months?

- (A) 234.25
- (B) 932.50
- (C) 287.80
- (D) 122.40

55. Which of the following is not desired in a good Software Requirement Specifications (SRS) document?

- (A) Functional requirements
- (B) Non-functional requirements
- (C) Goals of implementation
- (D) Algorithms for software implementation



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56. What is the appropriate pairing of items in the two columns listing various activities encountered in a software life cycle?

	List-I		List-II
P	Requirement capture	1	Module development and integration
Q	Design	2	Domain analysis
R	Implementation	3	behavioural modelling
S	Maintenance	4	Performance tuning

Codes:

- | | | | | |
|-----|---|---|---|---|
| | P | Q | R | S |
| (A) | 3 | 2 | 4 | 1 |
| (B) | 2 | 3 | 1 | 4 |
| (C) | 3 | 2 | 1 | 4 |
| (D) | 2 | 3 | 4 | 1 |
57. Arrange the following phases of Software development life cycle in order
- I Maintenance
 II Testing
 III Design
 IV Deployment
 V Gathering Requirements and Analysis
 VI Project Planning
 VII Coding or Implementation
- (A) I, II, III, IV, V, VI, VII
 (B) III, I, IV, II, VII, V, VI
 (C) VI, V, III, VII, II, IV, I
 (D) V, VII, III, I, IV, II, VI
58. Which of the following statements are True?
- I. The content diagram should depict the system as a single bubble.
 II. External entities should be identified clearly at all levels of DFDs

- III. Control information should not be represented in a DFD

- IV. A data store can be connected either to another data store or to an external entity

(A) II and III

(B) I, II and IV

(C) I and III

(D) I, II and III

59. A process which defines a series of tasks that have the following four primary objectives is known as :

- To identify all items that collectively defines the software configuration
- To manage changes to one or more of these items
- To facilitate the construction of different versions of an application

To ensure that software quality is maintained as the configuration evolves over time.

- (A) Software Quality Management Process
 (B) Software Configuration Management Process
 (C) Software Version Management Process
 (D) Software Change Management Process



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60. Equivalence partitioning is a _____ method that divides the input domain of a program into classes of data from which test cases can be derived.
- (A) White-box testing
(B) Black-box testing
(C) Orthogonal array testing
(D) Stress testing
61. A program P reads in 500 integers in the range [0,100] representing the scores of 500 students. It then prints the frequency of each score above 50. What would be the best way for P to store the frequencies?
- (A) An array of 50 numbers
(B) An array of 100 numbers
(C) An array of 500 numbers
(D) A dynamically allocated array of 550 numbers
62. A single array A[1...MAXSIZE] is used to implement two stacks. The two stacks grow from opposite ends of the array. Variables top1 and top2 (top1 < top2) point to the location of the topmost element in each of the stacks. If the space is to be used efficiently, the condition for "stack full" is :
- (A) (top1 = MAXSIZE/2) AND (top2 = MAXSIZE/2 + 1)
(B) top1 + top2 = MAXSIZE
(C) (top1 = MAXSIZE/2) or (top2 = MAXSIZE)
(D) top1 = top2 - 1
63. In a B tree of order four each node has at most _____ keys.
- (A) 2 (B) 3
(C) 4 (D) 5
64. Consider the following statements:
- (I) First-in-first-out types of computations are efficiently supported by STACKS.
(II) Implementing LISTS on linked list is more efficient than implementing LISTS on an array for almost all the basic LIST operations.
(III) Implementing QUEUES on a circular array is more efficient than implementing QUEUES on a linear array with two indices.
(IV) Last-in-first-out type of computations are efficiently supported by QUEUES.
- Which of the following is correct?
- (A) (II) and (III) are true
(B) (I) and (II) are true
(C) (III) and (IV) are true
(D) (II) and (IV) are true
65. Which one of the following data structures is useful in traversing a graph using breadth first technique?
- (A) Stack
(B) Linked list
(C) Queue
(D) Set



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66. What is the value of following recurrence?
 $T(n) = T(n/4) + T(n/2) + cn^2$
 $T(1) = c$
 $T(0) = 0$
 Where c is a positive constant
- (A) $O(n^3)$
 (B) $O(n^2)$
 (C) $O(n^2 \log n)$
 (D) $O(n \log n)$
67. The following sequence of operations is performed on stack:
 PUSH(10), PUSH(20), POP, PUSH(10), PUSH(20), POP, POP, POP, PUSH(20), POP
 The sequence of values popped out is:
- (A) 20, 10, 20, 10, 20
 (B) 20, 20, 10, 10, 20
 (C) 10, 20, 20, 10, 20
 (D) 20, 20, 10, 20, 20
68. A hash function f defined as $f(\text{key}) = \text{key} \bmod 7$ with linear probing is used to insert the keys: 37, 38, 72, 48, 98, 11 and 56 into a table indexed from 0 to 6. 11 will be stored in the location :
- (A) 3
 (B) 4
 (C) 5
 (D) 6
69. The worst case complexity of quick sort to sort any n numbers is :
- (A) $O(n \log n)$
 (B) $O(n^2)$
 (C) $O(\log n)$
 (D) $O(n^3)$
70. After partitioning an array with n elements in quick sort, how many elements will be in the correct position?
- (A) n
 (B) 0
 (C) 1
 (D) 2
71. 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 from the code given below:
- Assertion (a):** Turing machine is more powerful than PDA.
Reason (r): The Turing Machine has a more flexible form of memory than does the PDA.
- (A) Both (a) and (r) are true and (r) is correct explanation of (a)
 (B) Both (a) and (r) are true and (r) is not the correct explanation of (a)
 (C) (a) is true, but (r) is false
 (D) (a) is false, but (r) is true



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72. Given below are two statements :

Statement-I: Top down parsing is an attempt to find a leftmost derivation for an input string.

Statement-II: Top down parsing methods handle left recursive grammar efficiently.

Choose the most appropriate answer from the options given below:

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

73. Which of the following is/are correct?

I. A language is context-free if and only if it is accepted by the PDA.

II. PDA is a finite automaton with push-down stack.

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

74. Which two of the following four regular expressions are equivalent?

- (i) $(00)^*(\epsilon + 0)$
- (ii) $(00)^*$
- (iii) 0^*
- (iv) $0(00)^*$
- (A) (i) and (ii)
- (B) (ii) and (iii)

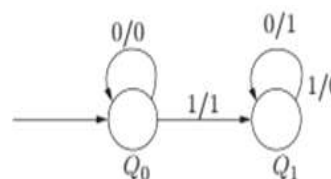
(C) (i) and (iii)

(D) (iii) and (iv)

75. If strings of a language L can be effectively enumerated in lexicographic (i.e., alphabetic) order, which of the following statements is true?

- (A) L is necessarily finite
- (B) L is regular but not necessarily finite
- (C) L is context-free but not necessarily regular
- (D) L is recursive but not necessarily context-free

76. The following diagram represents a finite state machine which takes as input a binary number from the least significant bit :



Which one of the following is True?

- (A) It computes 1's complement of the input number
- (B) It computes 2's complement of the input number
- (C) It increments the input number
- (D) It decrements the input number



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77. $S \rightarrow AC|CB, C \rightarrow aCb|\epsilon, A \rightarrow aA|a, B \rightarrow Bb|b$

In the correct grammar above, what is the length of the derivation (number of steps starting from S) to generate the string $a^l b^m$ with $l \neq m$?

- (A) $\max(l, m) + 2$
 (B) $l + m + 2$
 (C) $l + m + 3$
 (D) $\max(l, m) + 3$

78. The regular expression $(\epsilon+0)(\epsilon+1)$ refers to the set of strings/characters:

- (A) $\{01\}$
 (B) $\{10\}$
 (C) $\{0\}$
 (D) $\{0, 1\}$

79. Consider the following statements about the context-free grammar :

$$G = \{S \rightarrow SS, S \rightarrow ab, S \rightarrow ba, S \rightarrow \epsilon\}$$

- I. G is ambiguous.
 II. G produces all strings with equal number of a's and b's.
 III. G can be accepted by a deterministic PDA

Which combination below expresses all the true statements about G?

- (A) I only
 (B) I and III only

(C) II and III only

(D) I, II, and III

80. In the two list given below, List-I provides the list of peephole optimization techniques and List-II provides description/example of those techniques. Match the two lists and choose the correct answer from the code given below:

List-I	List-II
(Peephole Optimization Technique)	(Description)
P Unreachable Code	1. $Y=Y*1$ or $Y=Y+0$
Q Reduction in Strength	2. Jumps to conditional Jumps
R Algebraic simplification	3. Replacing expensive operations by equivalent cheaper ones
S Flow of Control Optimization	4. An unlabeled instruction immediately following and unconditional Jump
	5. Hardware instructions to implement certain specific operations

Codes:

	P	Q	R	S
(A)	1	2	3	4
(B)	4	3	1	2
(C)	4	5	3	1
(D)	2	1	3	5



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81. In the two list given below, List-I provides the list of Routing algorithms and List-II provides description of those algorithms. Match the two lists and choose the correct answer from the code given below:

List-I

(Routing algorithms)

- P. Flooding
 Q. Hierarchical Routing
 R. Broadcast Routing
 S. Multicast Routing

List-II

(Description)

1. Sending a packet to all destinations simultaneously.
2. Sending messages to well defined groups that are numerically large in size but small compared to the network as a whole.
3. The routers are divided into regions with each router knowing all the details about how to route packets to destinations within its own region.
4. Each router maintain a table giving the best known distance to each destination and which line to use to get there.
5. In this every incoming packet is sent out on every outgoing line except the one it arrived on.

Codes:

	P	Q	R	S
(A)	5	3	1	2
(B)	4	5	1	2
(C)	4	5	3	1
(D)	3	2	4	5

82. Given below are two statements:

Statement-I: The presentation layer is concerned with the syntax and semantics of the information submitted.

Statement-II: The protocols in the TCP/IP model are better hidden than in the OSI model.

Choose the most appropriate answer from the option given below:

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

83. The minimum size of an Ethernet frame is :

- (A) 18 bytes
 (B) 64 bytes
 (C) 46 bytes
 (D) 56 bytes


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84. The maximum throughput percentage for pure ALOHA is :
- (A) 12.2
(B) 18.4
(C) 36.8
(D) 24.4
85. Considering a classful addressing, the IP address 128.252.144.84 denotes :
- (A) 0.0.0.0 as network ID and 128.252.252.84 as node ID
(B) 128.0.0.0 as network ID and 128.252.127.84 as node ID
(C) 128.252.0.0 as network ID and 128.252.144.84 as node ID
(D) 128.252.144.0 as network ID and 128.252.144.84 as node ID
86. _____ is an Internet standard protocol for managing devices such as routers, switches and servers on Internet Protocol network.
- (A) SFTP
(B) SFP
(C) SMTP
(D) SNMP
87. Which of the following assertions is False about the Internet Protocol (IP)?
- (A) It is possible for a computer to have multiple IP addresses
(B) IP packets from the same source to the same destination can take different routes in the network
(C) IP ensures that a packet is discarded if it is unable to reach its destination within a given number of hops
(D) The packet source cannot set the route of an out going packet; the route is determined only by the routing tables in the routers on the way
88. Cloud computing is a model for enabling convenient and _____ network access to shared computing resources with automatic control.
- (A) Cost-effective
(B) On-Demand
(C) Faster
(D) Secure
89. Choose the best matching between Groups I and II :
- | Group-I | Group-II |
|--------------------|--|
| P. Data link layer | 1. Ensures reliable transport of data over a physical point-to-point link |
| Q. Network layer | 2. Encodes/decodes data for physical transmission |
| R. Transport layer | 3. Allows end-to-end communication between two processes
4. Routes data from one network node to the next |
- (A) P:1, Q:4, R:3
(B) P:2, Q:4, R:1
(C) P:2, Q:3, R:1
(D) P:1, Q:3, R:2



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90. The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet?
- (A) 62 subnets and 262142 hosts
 (B) 64 subnets and 262142 hosts
 (C) 62 subnets and 1022 hosts
 (D) 64 subnets and 1024 hosts
91. What is the correct sequence of steps in GA flow?
- I. Crossover
 II. Selection
 III. Mutation
- (A) I, II, III
 (B) III, I, II
 (C) II, I, III
 (D) II, III, I
92. 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 from the code given below:
- Assertion (a): Multilayer neural networks are more powerful than single-layer neural networks.
 Reason (r): A recurrent network is a network with feedback.
- (A) Both (a) and (r) are true and (r) is correct explanation of (a)
 (B) Both (a) and (r) are true and (r) is not the correct explanation of (a)
 (C) (a) is true, but (r) is false
 (D) (a) is false, but (r) is true
93. Given below are two statements:
- Statement-I:** Non linear planning approach was used by STRIPS.
Statement-II: In hierarchical planning, first the problem is solved completely, considering only preconditions whose criticality value is the lowest possible.
- Choose the most appropriate answer from the option given below:
- (A) Both statement-I and statement-II are correct.
 (B) Both statement-I and statement-II are incorrect.
 (C) Statement-I is correct and statement-II is incorrect.
 (D) Statement-I is incorrect and statement-II is correct.
94. Which of the following is not applicable to heuristic search technique?
- (A) Not guaranteed to provide a solution
 (B) Need not cause motion and need not be systematic
 (C) Guaranteed to provide the best solution
 (D) Reduces the computing time



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95. Consider a fuzzy set A defined on the interval $X = [0, 10]$ of integers by the membership function $\mu_A(x) = x / (x+2)$. Then the α cut corresponding to $\alpha = 0.5$ will be :
- (A) $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 (B) $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 (C) $\{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 (D) None of the above
96. Which of the following statement is True?
- (I) An agent acts in an environment.
 (II) The agent communicates with another agent or human.
 (III) All agents can improve their performance through learning.
- (A) I only
 (B) II only
 (C) I and II only
 (D) I, II, and III
97. Which of the following is/are the part of an intelligent problem?
- I. The initial state
 II. A set of actions
 III. A transition model
 IV. A set of goal states
 V. An action cost function
- (A) I, II only
 (B) I, II, III only
 (C) I, II, III, IV only
 (D) I, II, III, IV, V
98. What is the resolvent of the following clauses ($\neg$ represents not)?
- Indian (Karan)
 $\neg \text{Indian}(x) \vee \text{Hindu}(x)$
- (A) Hindu (Karan)
 (B) Hindu (x)
 (C) Indian (Karan)
 (D) $\text{Indian}(x) \vee \text{Hindu}(x)$
99. _____ search expands the deepest unexpanded node first.
- (A) Depth-first
 (B) Uniform-cost
 (C) Best-first
 (D) Breadth-first
100. If the available feedback provides the correct answer for example inputs, then the learning problem is called _____.
- (A) Supervised learning
 (B) Unsupervised learning
 (C) Reinforcement learning
 (D) Information-gain



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