Q1 In a pack of 42 cards, 3 cards are chosen one after the other. Find the number of ways this can be done without replacement:

(A) 1722 (B) 1752

(C) 68880 (D) 6880

Q2 Once the process is allocated CPU and executing which of the following events could not occur?

A. The process could issue an I/O request and then be placed in the Ready Queue

B. The process could create new subprocesses & wait for the termination of the subprocesses

C. The time slice of the process expires and it may join the waiting queue

D. The process is forcibly removed from the CPU and is put in the Waiting queue due to arrival of an interrupt

Choose the correct answer from the options given below:

(A) B Only

(B) D Only

(C) A and C Only

(D) A, C and D Only

Q3 Match List I with List II

List I	List II
A. Count to infinity problem	I. Mobile Adhoc Networks
B. IEEE 802.16	II. Distance vector routing
C. IEEE 802.15	III. WiMAX
D. AODV protocol	IV. Bluetooth

Choose the correct answer from the options given below:

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

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

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

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

Q4 What shall be the average waiting time per process if we know that 10 processes (on average) arrive every second and there are normally 20 processes in the queue?

(A) 03 seconds (B) 02 seconds

(C) 18 seconds (D) 09 seconds

Q5 Consider the following statements regarding Agent systems

A. Agent system comprises of an agent and an environment on which it acts

B. The controller part of an agent receives percepts from its body and sends commands to the environment

C. Agents act in the world through actuators which are non-noisy and always reliable.

D. The actuators of an agent convert stimuli into percepts

Choose the correct answer from the options given below:

(A) A, B Only (B) B, D Only

(C) C, D Only (D) B, C, D Only

Q6 The transformation of data from main memory to cache memory is referred as:

(A) Data exchange

(B) Data transformation

(C) Mapping

(D) Matching

Q7 Consider the following steps used by a knowledge base designer to represent a world

A. Selects atoms to represent propositions

B. Ask questions about intended interpretation

C. Choose a task domain

D. Axiomatizing the domain

Choose the correct answer from the options given below:

(A) $C \rightarrow A \rightarrow D \rightarrow B$

(B) $C \rightarrow A \rightarrow B \rightarrow D$

(C) $B \rightarrow C \rightarrow A \rightarrow D$

(D) $A \rightarrow C \rightarrow B \rightarrow D$

Q8 What will be the output of the following C programming code:

```
int i, j;
for(i=1; i<5; i+=2)
for(j=1; j<i; j+=2)
   printf("%d", j);
```

(A) 1

(B) 1 2

(C) 1 3

(D) 1 1 3

Q9 Consider the Boolean expression $A(x, y, z) = x(y'z)'$. Which of the following is complete sum-of-products form of the given Boolean expression.

(A) $xyz + x'yz' + x'y'z'$

(B) $xyz' + x'yz' + x'y'z'$

(C) $xyz' + xy'z + x'y'z'$

(D) $xyz + xyz' + xy'z'$

Q10 Match List I with List II

List I (Software Quality Characteristic)	List II (Description)	
A. Reliability	I.	Ability to transfer the software from one organization or hardware / software environment to another.
B. Efficiency	II.	Capability of software to maintain its level of performance under stated conditions for a stated period of time.
C. Maintainability	III.	Relationship between the level of performance of the software and the amount of resources used, under stated conditions.
D. Portability	IV.	Effort needed to make modifications, including corrections, improvements or adaptation of software to changes in environment, requirements and functional specifications.

Choose the correct answer from the options given below:

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

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

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

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

Q11 Match List I with List II

List I	List II
A. Address Space	I. Associative Mapping
B. Memory Space	II. Logical address
C. Cache Memory	III. physical address
D. Segmented Program	IV. Virtual address

Choose the correct answer from the options given below:

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

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

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

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

Q12 Match List I with List II

List I	List II
A. Digital Signature	I. Asymmetric encryption algorithm.
B. Hash Function	II. Confirms authenticity and integrity.
C. AES	III. Produces a fixed-size digest.
D. RSA	IV. Symmetric encryption algorithm.

Choose the correct answer from the options given below:

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

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

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

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

Q13 What would be the equivalent pointer expression for referring the array element ar[m][n][0]

(A) * (* (* (ar) +m+n)+0)

(B) (* (* (*ar + m) + n) + o)

(C) (* (* (ar+m)+n)+o)

(D) *(*(*(ar+m)+n)+0)

Q14 Which of the following Grammars is/are only Context Free?

A	S → Ab aS → aA A → a	B	S → Ab A → Sa A → a
C	S → AS S → aA A → a	D	S → Ab S → aA A → a
E	S → Sb A → Aa A → ε		

Choose the correct answer from the options given below:

(A) A, B Only

(B) C, D Only

(C) C, E Only

(D) A, B, D, E Only

Q15 CB84000D001C001C is the content of a UDP header in hexadecimal format. The source port number is

(A) 52100 (B) 13

(C) 28 (D) 52000

Q16 Match List I with List II

List I (GA termination criteria)	List II (description)
A. Worst Individual	I. At least half of the individual will be better than or equal to convergence value
B. Best Individual	II. Guarantees that virtually all individuals in the population will be within a particular fitness range
C. Sum of Fitness	III. Guarantees that the entire population to be of a minimum standard
D. Median Fitness	IV. Faster search Convergence, guaranteeing at least one best solution

Choose the correct answer from the options given below:

(A) $A \rightarrow III, B \rightarrow IV, C \rightarrow II, D \rightarrow I$

(B) $A \rightarrow IV, B \rightarrow III, C \rightarrow I, D \rightarrow II$

(C) $A \rightarrow II, B \rightarrow I, C \rightarrow III, D \rightarrow IV$

(D) $A \rightarrow II, B \rightarrow III, C \rightarrow IV, D \rightarrow I$

Q17 Consider the following three relations Employee (eid, eName), Comp(cid, cName), Own(eid, cid). Which of the following relational algebra expression return the set of eids who own all brands:

(A) $\pi_{\text{eid}}\ (\pi_{\text{eid, cid}}\ (\text{ Own }) / \pi_{\text{cid}}\ (\text{ Comp }))$

(B) $\pi_{\text{eid}}\ (\pi_{\text{eid}}\ (Own) \times \pi_{\text{cid}}\ (Comp))$

(C) $\pi_{\text{eid}}\ (\pi_{\text{eid, cid}}\ (Own) \times \pi_{\text{cid}}\ (Comp))$

(D) $\pi_{\text{eid}}\ (\pi_{\text{eid}}\ (\text{ Own }) \times (\pi_{\text{cid, , Name}}\ (\text{ Own }) / \pi_{\text{cid}}\ (\text{ Comp })))$

Q18 The process followed in order to find difficult, unknown and hidden information about a software system is called

(A) Software Engineering

(B) Software Re-Engineering

(C) Reverse Engineering

(D) Inverse Engineering

Q19 Which of the followings shows the correct hierarchy of a layered file system in an operating system

A. Logical File System

B. File Organization Module

C. Basic File System

D. I/O Control

E. Application Programs

Choose the correct answer from the options given below:

(A) $A \rightarrow B \rightarrow D \rightarrow C \rightarrow E$

(B) $D \rightarrow E \rightarrow C \rightarrow A \rightarrow B$

(C) $E \rightarrow A \rightarrow B \rightarrow C \rightarrow D$

(D) $E \rightarrow C \rightarrow B \rightarrow A \rightarrow D$

Q20 Which of the followings is NOT a software characteristic?

(A) Software does not wear out

(B) Software is flexible

(C) Software is not manufactured

(D) Software is always correct

Q21 Which of the following cohesions are better than the Procedural Cohesion

A. Functional Cohesion

B. Sequential Cohesion

C. Temporal Cohesion

D. Communicational Cohesion

E. Logical Cohesion

Choose the correct answer from the options given below:

(A) A and D Only

(B) A, B and D Only

(C) C, D and E Only

(D) A, D and E Only

Q22 Consider the following infix expression $Q : ((A + B)^* D) \uparrow (E - F)$. The equivalent postfix expression of Q is

(A) $AB + D * EF \uparrow$- (B) $AB + D^* - \uparrow EF$

(C) $AB + DE^* F - \uparrow$ (D) $AB + D * EF - \uparrow$

Q23 Which of the following trees are height balanced?

A. Binary Search Tree

B. AVL Tree

C. Red-Black Tree
D. B Tree
Choose the correct answer from the options given below:
(A) A and D Only
(B) A, B and D Only
(C) C and D Only
(D) B, C and D Only

Q24 In a Stop-and-wait system, the bandwidth of the line is 1 Mbps , and 1 bit takes 30 milliseconds to make a round trip. The bandwidth-delay product is
(A) 15,000 bits (B) 20,000 bits
(C) 30,000 bits (D) 60,000 bits

Q25 Which of the followings belongs to MaCall's quality factors?
A. Maintainability
B. Usability
C. Integrity
D. Functionality
Choose the correct answer from the options given below:
(A) A and D Only
(B) A, B and D Only
(C) C and D Only
(D) A, B and C Only

Q26 Arrange the process of virtualization in cloud environments.
A. Hypervisor installed on physical server
B. Virtual machines created
C. Resources allocated to Virtual machines
D. Virtual machines run isolated workloads
Choose the correct answer from the options given below:
(A) B, C, A, D (B) A, B, C, D
(C) A, C, B, D (D) B, C, D, A

Q27 A positive integer selected at random from the set of positive integers not exceeding 200. Which of the followings is the probability that the selected number is divisible by either 2 or 5 ?
(A) 2 / 5 (B) 3 / 5
(C) 4 / 5 (D) 1 / 5

Q28 Match List I with List II

List I	List II
A. If the Indian team wins, then it is raining	I. Inverse
B. If the Indian team does not win, then it is not raining	II. Converse
C. If it is raining, then the Indian team wins	III. Contrapositive
D. If it is not raining, then the Indian team does not win	IV. Conditional

Choose the correct answer from the options given below:
(A) A-II, B-I, C-IV, D-III
(B) A-III, B-I, C-II, D-IV
(C) A-IV, B-I, C-II, D-III
(D) A-III, B-II, C-IV, D-I

Q29 Binary equivalent to $(AOF)_{16}$ is :
(A) 111000111
(B) 101001111
(C) 101000001111
(D) 111100001010

Q30 Consider the following interrupt protection levels in Linux, and arrange them in the increasing order of their priorities.
A. User-Mode Programs (Preemptible)
B. Bottom Half Interrupt Handlers
C. Top Half Interrupt Handlers
D. Kernel System Service Routines (Preemptible)
Choose the correct answer from the options given below:
(A) $B \rightarrow A \rightarrow C \rightarrow D$
(B) $C \rightarrow B \rightarrow A \rightarrow D$
(C) $C \rightarrow A \rightarrow B \rightarrow D$
(D) $A \rightarrow D \rightarrow B \rightarrow C$

Q31 Which of the following technique is used for Clipping?
(A) Stack based Seed
(B) Scan Line Seed
(C) Sutherland-Cohen
(D) Inverse Scaling

Q32 Estimation of software development effort for organic software in basic COCOMO is
(A) $E = 2.4(KLOC)^{1.05} PM$
(B) $E = 3.4(KLOC)^{1.06} PM$
(C) $E = 2.0(KLOC)^{1.05} PM$

(D) $E = 2.4(KLOC)^{1.07} PM$

Q33 Consider R(A, B, C, D, E) be relation with following dependencies: C->F, E->A, EC->D, A->B. Which of the following is a key for R ?

(A) CD (B) EC

(C) AE (D) AC

Q34 Let P denote "She is intelligent" and let Q denote "She is happy."

Given below are the statements:

(a) If She is intelligent, then She is unhappy.

(b) She is neither intelligent nor happy.

(c) It is necessary to be not intelligent in order to be happy.

(d) To be not intelligent is to be unhappy.

Which of the following is correct Propositional expression for the above statements:

(A) $P \rightarrow \neg Q$; (b) $P \wedge \neg Q$; (c) $Q \rightarrow \neg P$; (d) $P \rightarrow \neg Q$

(B) $P \rightarrow Q$; (b) $\neg P \wedge \neg Q$; (c) $\neg Q \rightarrow P$; (d) $\neg P \rightarrow \neg Q$

(C) $P \rightarrow \neg Q$; (b) $\neg P \wedge \neg Q$; (c) $Q \rightarrow \neg P$; (d) $\neg P \rightarrow \neg Q$

(D) $P \rightarrow \neg Q$; (b) $P \wedge \neg Q$; (c) $Q \rightarrow P$; (d) $\neg P \rightarrow \neg Q$

Q35 In a group of 120 people: 65 eat Rice, 45 eat bread, 42 eat curd, 20 eat both Rice and bread, 25 eat both Rice and curd, 15 eat both bread and curd, and 8 eat all three items. Which of the following is the number of people who eat at least one of the three items:

(A) 56 (B) 100

(C) 92 (D) 65

Q36 Consider the following table defining the sample inputs and corresponding target values for a perceptron model.

Sample No	x1	x2	target	w1	w2
S1	0	0	**0**	0	0
S2	0	1	**1**		
S3	1	0	**1**		
S4	1	1	**1**		

What shall be the value of updated weights after applying all the samples S 1 to S 4 (in the order S 1, S 2, S3, S4) to this model. Given that the initial weights w 1=0, w 2=0, learning rate =0.1 and no bias is involved in the perceptron. The activation function for this perceptron is given below

$$y\_observed = \begin{cases} 1, & \text{if } y_{in} > 0 \\ 0, & \text{if } y_{in} < 0 \end{cases}$$

(A) w1=0.1, w2=0.1 (B) w1=0.0, w2=0.2

(C) w1=0.0, w2=0.1 (D) w1=0.2, w2=0.2

Q37 Which of the following algorithms use Greedy strategy?

A. Dijkstra's algorithm

B. Kruskal's algorithm

C. Huffman coding

D. Bellman-Ford algorithm

Choose the correct answer from the options given below:

(A) A, B and D Only

(B) A, B and C Only

(C) C and D Only

(D) A and D Only

Q38 The packet sent by a node to the source to inform it of congestion is called

(A) Explicit (B) Backpressure

(C) Choke (D) Retransmission

Q39 Which of the following are controlled-access protocols

A. Reservation

B. Polling

C. TDMA

D. Token Passing

E. CSMA/CA

Choose the correct answer from the options given below:

(A) A and D Only

(B) A, B and D Only

(C) C, D and E Only

(D) A, D and E Only

Q40 Consider the following steps involved in the application of Genetic algorithm for a problem

A. Select a pair of parents from the population

B. Apply mutation at each locus with probability p_m

C. Calculate fitness of each member of the population

D. Apply crossover with probability p_c to form offsprings

Choose the correct answer from the options given below describing the correct order of the above steps:

(A) $A \rightarrow C \rightarrow B \rightarrow D$

(B) $C \rightarrow A \rightarrow D \rightarrow B$

(C) $C \rightarrow A \rightarrow B \rightarrow D$

(D) $A \rightarrow D \rightarrow B \rightarrow C$

Q41 The longest common subsequence of {1,2,3,2,4,1,2} and {2,4,3,1,2,1} is

(A) 2,1,2,3 (B) 1,3,2,1

(C) 2,3,2,1 (D) 2,3,1,2,1

Q42 Considering the following statements:

A. Data transformation is involved in Datamining process.

B. Online database is used in Data warehouse.

C. Classification is a measure of accuracy.

D. K-means clustering algorithm is based on the concept of minimizing the within-cluster variance.

E. Pattern evaluation is a process to identify knowledge based on interestingness measure.

Choose the correct answer from the options given below:

(A) B, C, E Only (B) A, D, E Only

(C) A, C, E Only (D) A, C, D Only

Q43 Match List I with List II

List I	List II
A. Equivalence Partitioning	I. Measures independent paths in code
B. Boundary Value Analysis	II. Divides input into valid/invalid sets
C. Cyclomatic Complexity	III. Focuses on limits of input ranges
D. Decision Table Testing	IV. In which a number of combinations of actions are tested under varying sets of conditions.

Choose the correct answer from the options given below:

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

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

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

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

Q44 Gray code equivalent to decimal number 8 is:

(A) 1000 (B) 1100

(C) 1010 (D) 1110

Q45 Match List I with List II

List I (Hashing Collision Handling Method)	List II (Strategy)
A. Chaining	I. Check next slot
B. Linear Probing	II. Use the second hash function
C. Quadratic Probing	III. Linked list at index
D. Double Hashing	IV. Skip slots using quadratic step

Choose the correct answer from the options given below:

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

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

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

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

Q46 The write operation in I/O operation does the following-

(A) Transfer data from I/O device to memory

(B) Transfer data from memory to I/O device

(C) Transfer data from CPU register to memory

(D) Transfer data from CPU register to I/O device

Q47 Which of the followings is Not a parent selection technique used in genetic algorithm implementations

(A) Radial (B) Tournament

(C) Boltzmann (D) Rank

Q48 Maintaining a graph in memory by means of its adjacency matrix is known as

(A) Complete Representation

(B) Linked Representation

(C) Circular Representation

(D) Sequential Representation

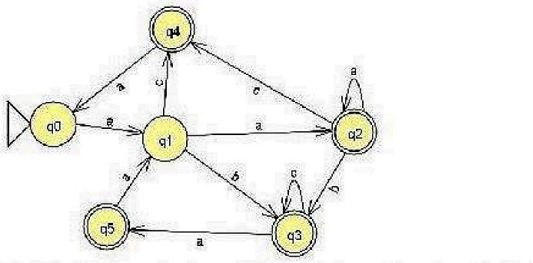
Q49 Match List I with List II

List I	List II
A. Circular Queue	I. Print Queue
B. Priority Queue	II. CPU Scheduling
C. Double Ended Queue	III. Dijkstra algorithm
D. Simple Queue	IV. Palindrome checking

Choose the correct answer from the options given below:

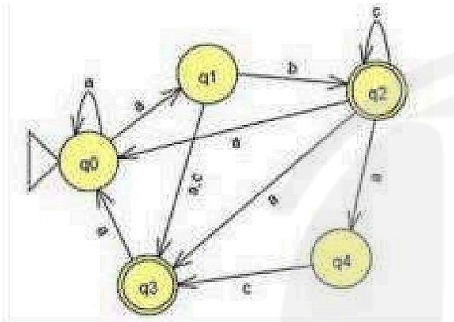
(A) A-II, B-III, C-I, D-IV
(B) A-II, B-III, C-IV, D-I
(C) A-III, B-II, C-I, D-IV
(D) A-IV, B-II, C-I, D-III

Q50 Consider the following DFA

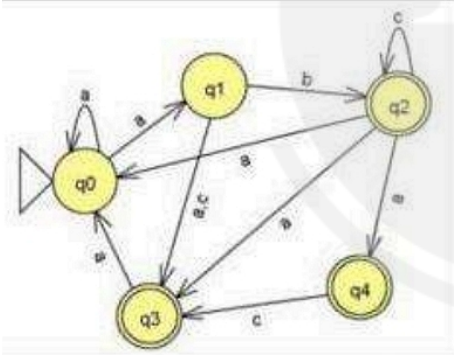


Which of the following NFA is valid for the given DFA ?

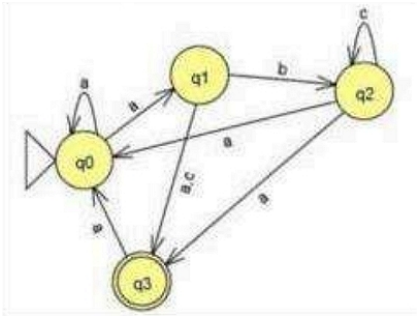
(A)



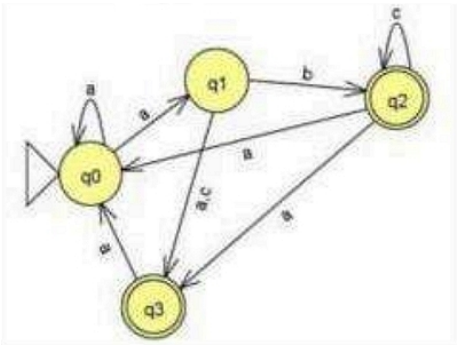
(B)



(C)



(D)



Q51 Which of the following gates do not give output 1 when both the inputs are 0 -
A. NAND gate
B. NOR gate
C. X-OR gate
D. X-NOR gate
Choose the correct answer from the options given below:
(A) A, B Only
(B) B, C Only
(C) C, D Only
(D) C Only

Q52 Consider the relation $T1(A, B, C, D, E)$ with the dependencies $\{EB \rightarrow C, D \rightarrow E, EA \rightarrow B\}$ and $T2(A, B, C, D)$ with the dependencies $\{C \rightarrow A,\ A \rightarrow B,\ A \rightarrow D\}$. Which of the following is TRUE?
(A) T1 is in 3NF
(B) T2 is in 3NF
(C) T 1 is not in 3NF
(D) T1 is in 2NF

Q53 Choose the correct statement for a group G :
(A) If for all $x, y \in G, (xy)^2 = x^2y^2$ then G is Commutative.
(B) If for all $x \in G, x^3 = 1$, then G is Commutative. 1 is the identity element of G.
(C) If for all $x \in G, x^5 = 1$, then G is Commutative. 1 is the identity element of G.
(D) If G is Commutative, the sub-group of G need not be Commutative.

Q54 Consider the following piece of C programming code:
int x=128, y=110;
do

```
{
   If(x>y)
      x=x-y;
   else
      y=y-x;
} while(x!= y)
printf("%d",x);
```

Which one will be the output?

(A) 18 (B) 2

(C) 92 (D) 74

Q55 Arrange the steps involved when a user enters a URL in a browser and accesses a website.

A. DNS resolution

B. HTTP request sent

C. URL entered in the browser

D. IP address obtained

E. Webpage displayed

Choose the correct answer from the options given below:

(A) B, A, C, E, D (B) C, B, A, E, D

(C) B, C, D, A, E (D) C, A, D, B, E

Q56 Match List I with List II

List I	List II
A. Clustered Page Table	I. Generally considered inappropriate for 64 bit architectures.
B. Hierarchical Page Table	II. Has only entry for each real page (or frame) of memory.
C. Segmentation	III. Useful for Sparse address spaces.
D. Inverted Page Table	IV. Supports a user view of the system.

Choose the correct answer from the options given below:

(A) $A \rightarrow III, B \rightarrow IV, C \rightarrow II, D \rightarrow I$

(B) $A \rightarrow III, B \rightarrow I, C \rightarrow IV, D \rightarrow II$

(C) $A \rightarrow II, B \rightarrow III, C \rightarrow I, D \rightarrow IV$

(D) $A \rightarrow IV, B \rightarrow III, C \rightarrow II, D \rightarrow I$

Q57 Match List I with List II

List I	List II
A. Overloading	I. Since function call is resolved during run time, the execution is Slow.
B. Early binding	II. Since function call is resolved during compilation time, the execution is much faster.
C. Overriding	III. Supports compile-time polymorphism.
D. Late Binding	IV. Supports run-time polymorphism.

Choose the correct answer from the options given below:

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

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

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

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

Q58 Identify the correct statement(s) from the followings with respect to Spinlock Semaphores

A. The name refers to busy waiting semaphores.

B. They are not useful when the locks are to be held for a short duration of time.

C. It may require multiple context switches when a process waits on a lock.

D. They are often employed on Uniprocessor systems.

Choose the correct answer from the options given below:

(A) A Only

(B) D Only

(C) B, D Only

(D) A, C and D Only

Q59 Consider the following statements for XML (Extensible Markup Language) :

A. The number of tags decreases and users can define their own tags.

B. Its is used for Presentation.

C. It is case sensitive.

D. It is dynamic.

Which of the above statements are true ?

(A) B, C, D Only

(B) A, B, D Only

(C) A, C, D Only

(D) B, D Only

Q60 Match List I with List II

List I (Operations on Fuzzy Sets)	List II (Description)
A. Intersection	I. $\mu_A(x) + \mu_B(x) - \mu_A(x) \cdot \mu_B(x)$
B. Bounded Sum	II. $\max(0,\ \mu_A(x) - \mu_B(x))$
C. Bounded Difference	III. $\min(1,\ \mu_A(x) + \mu_B(x))$
D. Algebraic Sum	IV. $\min(\mu_A(x),\ \mu_B(x))$

Choose the correct answer from the options given below:

(A) $A \to III, B \to I, C \to II, D \to IV$

(B) $A \to III, B \to II, C \to IV, D \to I$

(C) $A \to IV, B \to III, C \to II, D \to I$

(D) $A \to II, B \to I, C \to III, D \to IV$

Q61 Which of the following is not the characteristics of packet switching?

(A) Data is broken into packets

(B) Each packet may take a different rout

(C) Requires a dedicated path

(D) Supports dynamic routing

Q62 What is the total swap time (Swap in Swap out) in a system for a 15 MB process with a transfer rate of 30 MBps . Given that there is an average latency of 12 ms , however no head seeks involved.

(A) 1.024 sec (B) 1.00 sec

(C) 0.512 sec (D) 12 sec

Q63 Match List I with List II

List I	List II
A. Oblique Projection	I. When the direction of projection is so chosen that the lines perpendicular to the plane of projection are foreshortened.
B. Cavalier Projection	II. When the direction of projection is so chosen that there is no foreshortening of lines perpendicular to the plane of projection.
C. Cabinet Projection	III. When the direction of projection is perpendicular to the plane of projection.
D. Orthographic Projection	IV. When the angle between the projectors and the plane of projection is not equal to 90°.

Choose the correct answer from the options given below:

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

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

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

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

Q64 Match List I with List II

List I	List II
A. RAID Level 2	I. Block interleaved distribution parity
B. RAID Level 3	II. Also known as P+Q redundancy Scheme
C. RAID Level 5	III. Bit interleaved parity
D. RAID Level 6	IV. Also known as Memory style error correcting code organization

Choose the correct answer from the options given below:

(A) $A \to IV, B \to III, C \to I, D \to II$

(B) $A \to III, B \to IV, C \to I, D \to II$

(C) $A \to I, B \to III, C \to IV, D \to II$

(D) $A \to II, B \to IV, C \to I, D \to III$

Q65 What will be the output of the following C Programming code :

```
void main ()
{
   int *i,a=12,b=2,c;
   c=(a=a+b,b=a/b,a=a*b,b=a-b)
   i=&c;
   printf("%d", --(*i));
}
```

(A) 91 (B) 90

(C) 98 (D) 92

Q66 Which of the following is not a requirement elicitation Technique

(A) Interviews

(B) The use case approach

(C) Facilitated Application Specification Technique (FAST)

(D) Data Flow diagram

Q67 Consider the following table about processes, their burst time and arrival time

Process	Burst Time	Arrival Time
P1	09	0
P2	30	0
P3	04	0
P4	08	2
P5	11	6

Now which of the process shall finish second last as per the respective GANTT charts for the nonpreemptive SJF and Round Robin (time quantum =10) scheduling methods.

(A) $SJF : P_4; RR : P_4 : P_4$ (B) $SJF : P_5; RR : P_4 : P_5$

(C) $SJF : P_4; RR : P_3$ (D) $SJF : P_5; RR : P_5$

Q68 Only legal pointer operations:

A. pointer + number $\rightarrow$ pointer

B. pointer - number $\rightarrow$number

C. pointer + pointer $\rightarrow$ pointer

D. pointer - pointer $\rightarrow$ pointer

E. pointer - pointer $\rightarrow$ number

Choose the most appropriate answer from the options given below:

(A) A, B, C Only

(B) A, B, D Only

(C) A, B Only

(D) A, E Only

Q69 Arrange the following in the increasing order of coupling from lowest coupling to highest coupling.

A. Common Coupling

B. Stamp Coupling

C. Control Coupling

D. External Coupling

E. Content Coupling

Choose the correct answer from the options given below:

(A) E, A, C, B, D (B) D, B, A, E, C

(C) B, C, D, A, E (D) C, A, B, D, E

Q70 In a relational database, which one of the following is CORRECT:

(A) A relation with only two attributes is always in BCNF.

(B) If all attributes of a relation are prime attributes then the relation in BCNF

(C) Every relation has at least one non-prime attribute.

(D) BCNF decomposition preserves functional dependencies.

Q71 Which of the following statement is correct for Pthreads?

(A) It refers to POSIX standard (IEEE 1002.1c)

(B) This standard defines API for thread creation only

(C) This is a specification only for thread behavior and not its implementation

(D) Operating systems like Solaris, Linux Mac OS X, except Tru64 UNIX, implement Pthreads

Q72 Consider the operators used in C Programming given below:

A. &&

B. +=

C. >>

D. >=

E. ?:

Choose among the following the correct order of precedence of the operators given above (higher to lower):

(A) C, D, E, B, A (B) C, A, D, E, B

(C) C, D, A, E, B (D) D, C, A, B, E

Q73 The computer needs to process each instruction with the following sequence of steps:

A. Calculate the effective address

B. Fetch the Instruction from memory

C. Decode the instruction

D. Fetch the operands from the memory

E. Execute the Instruction

Choose the correct answer from the options given below:

(A) A, B, C, D, E (B) B, A, D, A, E

(C) B, C, A, D, E (D) C, B, A, D, E

Q74 Which of the followings is not a valid property over two fuzzy relations $\widetilde{R}$ and $\widetilde{S}$ which must be obeyed for performing λ-cut defuzzifications?

(A) $\left(\widetilde{R} \cup \widetilde{S}\right)_\lambda = \widetilde{R}_\lambda \cup \widetilde{S}_\lambda$

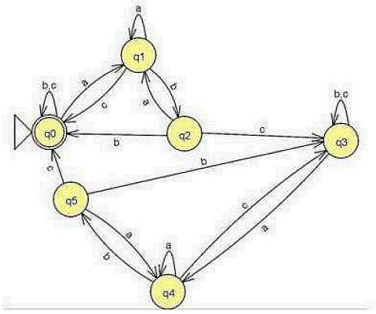
(B)

$\left(\widetilde{R} \cap \widetilde{S}\right)_\lambda = \widetilde{R}_\lambda \cap \widetilde{S}_\lambda$

(C) $\left(\overline{\widetilde{R}}\right)_\lambda \neq \overline{R}_\lambda except\ when\ \lambda = 1$

(D) For any $\lambda \leq \beta,\ where\ 0 \leq \beta \leq 1, it\ is\ true\ that\ R_\beta \subseteq R_\lambda$

Q75 Consider the following DFA that generates set of strings over $\Sigma = \{a, b, c\}$



Now identify that which of the followings is the best description of the language for the above DFA

(A) $L = (a^* + b^* + c^*)^+$

(B) $L = (a + b + c)^* (abc)^+ (a + b + c)^*$

(C) L = { Set of strings, all starting with ' a, b, c' but ending with ' c ' }

(D) L = { Set of strings, all having even count (including 0) of substring 'abc' }

Q76 Match List I with List II

List I	List II
A. Type 3 Grammar	I. V → (V ∪ Σ)*
B. Type 2 Grammar	II. $\lambda \vee \beta \rightarrow \lambda(\vee \cup \Sigma)^* \beta$, where $(\lambda, \beta)\varepsilon(\vee \cup \Sigma)^*$
C. Type 1 Grammar	III. (V ∪ Σ)* → (V ∪ Σ)*
D. Type 0 Grammar	IV. $V \rightarrow V \Sigma\ I\ \Sigma$

Choose the correct answer from the options given below:

(A) $A \rightarrow II, B \rightarrow III, C \rightarrow IV, D \rightarrow I$

(B) $A \rightarrow III, B \rightarrow I, C \rightarrow IV, D \rightarrow II$

(C) $A \rightarrow IV, B \rightarrow I, C \rightarrow II, D \rightarrow III$

(D) $A \rightarrow III, B \rightarrow II, C \rightarrow I, D \rightarrow IV$

Q77 Considering the following statements:

A. A non-serial schedule is said to be conflict serializable, if it is conflict-equivalent to some serial schedule.

B. A non-serial schedule is said to be view serializable if it is view-equivalent to some serial schedule.

C. A schedule is said to be serial, if instructions of participating transactions are chronologically interleaved with each other.

D. A conflict-serializable schedule will be view-serializable also but vice-versa may not be true.

Choose the correct answer from the options given below:

(A) A, B, C, D

(B) A, B, C Only

(C) A, B, D Only

(D) B, C, D Only

Q78 Which of the following statements is/are TRUE about encryptions techniques?

A. In symmetric key cryptography, the secrecy/protection of the key generating function must be of higher level than the decrypting function.

B. The DES technique works by taking 64 bit chunk value and 56 bit key over a series of transformations.

C. The Twofish symmetric block algorithm works on variable key length of upto 196 bits over a block of 128 bits.

D. RC_4 is the most commonly used stream cipher that encrypts & decrypts a stream of bits/bytes instead of blocks.

Choose the correct answer from the options given below:

(A) B, C Only (B) A, D Only

(C) A, C Only (D) B, D Only

Q79 Which of the following statements are true ?

A. In the write-through policy, only the cache is updated

B. In the write-back policy, both cache and main memory are updated

C. Cache coherence problems exist in multiprocessors with private caches because of the need to share writable data

D. Cache coherence problem can be solved by means of hardware-only scheme

Choose the correct answer from the options given below:

(A) A, B Only (B) B, C Only

(C) C, D Only (D) A, B, C Only

Q80 Given that η refers to learning rate and x_i refers to the i^{th} input to the neuron, Which of the followings most suitably describes the weight updation rule of a Kohonen SOM? (where ' j ' refers to the j^{th} neuron in the lattice)
(A) $w_{ij}(new) = (1-\eta)^* w_{ij}(old) + \eta^* x_i$
(B) $w_{ii}(new) = \eta^* w_{ii}(old) + (1-\eta)^* x_i$
(C) $w_{ij}(new) = (1-\eta)^* w_{ij}(old) + x_i$
(D) $w_{ij}(new) = w_{ij}(old) + \eta^* x_i$

Q81 Consider the following statements regarding STRIPS representation of a Planning problem
A. STRIPS is a Feature-centric representation
B. The features describing state of the world are divided into Primitive and Derived
C. The STRIPS representation of the action comprises of Precondition and Effect
D. STRIPS can directly define conditional effects.
Choose the correct answer from the options given below:
(A) A, C Only (B) B, C Only
(C) A, D Only (D) B, C, D Only

Q82 The tight asymptotic bound for the recurrence $T(n) = 2T(n/4) + \sqrt{n}$ is
(A) $\Theta(\sqrt{n})$ (B) $\Theta(n \log n)$
(C) $\theta(\sqrt{n} \log n)$ (D) $\Theta(n \log \sqrt{n})$

Q83 When developing a dynamic programming algorithm, the sequence of steps followed is:
A. Construct an optimal solution from computed information.
B. Recursively define the value of an optimal solution.
C. Characterize the structure of an optimal solution.
D. Compute the value of an optimal solution, typically in a bottom-up fashion.
Choose the correct answer from the options given below:
(A) B, C, A, D (B) B, A, C, D
(C) C, B, A, D (D) C, B, D, A

Q84 Which of the following are examples of data encoding schemes?
A. Non-Return to Zero (NRZ)
B. Manchester Encoding
C. Amplitude Modulation
D. Hamming code
E. Bipolar AMI
Choose the correct answer from the options given below:
(A) A, C and D Only
(B) A, B and D Only
(C) C, D and E Only
(D) A, B and E Only

Q85 Arrange the following types of testing in the order they are usually performed in the software Development life cycle.
A. Integration testing
B. Unit testing
C. System Testing
D. Acceptance Testing
Choose the correct answer from the options given below:
(A) B, C, A, D (B) B, A, C, D
(C) C, B, A, D (D) C, B, D, A

Q86 The correct sequence of constructing Huffman tree is
A. Repeat until root formed
B. Create leaf nodes
C. Build priority queue
D. Combine lowest frequency nodes
Choose the correct answer from the options given below:
(A) B, C, A, D (B) D, B, A, C
(C) B, C, D, A (D) C, A, B, D

Q87 Let m and n are positive integers. Then
(A) If n neq 1, then m<m n.
(B) If k is composite, then k=m n where 1<m, n>k
(C) If mn =1, then m =1 and n =1.
(D) If k is composite, then k=m n where 1<m, n<k
Which of the following is correct:
(A) (A), (C), (D) (B) (B), (C), (D)
(C) (A),(B) (D) (A), (B), (C)

Q88 Arrange the following parsers in increasing order of their power of handling grammars i.e. from the least powerful parser to the most powerful parser.
A. LR (0)
B. LR (1)
C. LALR(1)

D. LL (0)
E. SLR
Choose the correct answer from the options given below:
(A) $\mathrm{LL}(0) \rightarrow \mathrm{LR}(0) \rightarrow \mathrm{SLR} \rightarrow \mathrm{LR}(1) \rightarrow \mathrm{LALR}(1)$
(B) $\mathrm{SLR} \rightarrow LR(0) \rightarrow LL(0) \rightarrow LR(1) \rightarrow LALR(1)$
(C) $LL(0) \rightarrow LR(0) \rightarrow SLR \rightarrow LALR(1) \rightarrow LR(1)$
(D) $\mathrm{LR}(0) \rightarrow LL(0) \rightarrow SLR \rightarrow LR(1) \rightarrow LALR(1)$

Q89 The right sequence of CPU program to input data will be :
A. Read status register
B. Check flag bit
C. Read Data Register
D. Transfer data to memory
Choose the correct answer from the options given below:
(A) A, B, C, D (B) B, A, C, D
(C) C, B, A, D (D) A, C, B, D

Q90 The right sequence of suboperations that are performed in arithmetic pipeline is-
A. Align the mantissas
B. Add or subtract the mantissas
C. Normalize the result
D. Compare the exponents
Choose the correct answer from the options given below:
(A) D, A, B, C (B) D, B, A, C
(C) B, C, A, D (D) B, C, D, A

Directions (91-95) Read the following passage and answer the given questions.
Consider the following Three Address code sample for solving the questions :
100:t1=y+2
101 : initial = x/t1
102: limit = 10
103: if i >j goto 105
104 : goto 111
105: if num > b goto 107
106: goto 111
107: num = limit-1
108:b=y+2
109: i = i - num
110: goto 103
111: j= i - num
112:k=j+b

Q91 What are the various LEADERS (leading statements) for the TAC given in the passage?
(A) 100,102,103,104,105,107,110
(B) 100,103,105,107,111,112
(C) 100,103,105,106,107,111
(D) 100,103,104,105,106,107,111

Q92 Which of the following is the Optimized version for the given TAC in the passage
(A) 100:t1 =y+2
101 : initial = x/t1
102: limit = 10
103: if i >j goto 105
104 : goto 111
105: if num > b goto }10
106: goto 111
107:b=y+2
108: i=i - limit-1
109: goto 103
110:k=i+b
(B) 100:t1=y+2
101 : initial = x/t1
102: limit = 10
103: if i >j goto 105
104: if num < b goto }11
105: num = limit-1
106:b = t1
107: i=i -num
108: goto 103
109:k=i+b
(C) 100: t1 = y + 2
101: limit = 10
102: num = 9
103: b = t1
104: if i > j goto 106
105: goto 110
106: if num > b goto 108
107: goto 110
108: i = i - num
109: goto 104
110: j = i - num
111: k = j + b

(D) 100:t1=y+2
101 : initial = x/t1
102: limit = 10
103: if i >j goto 105
104 : goto 111
105: if num < b goto 111
106: num = limit-1
107:b=t1
108: i=i -num
109 : goto 103
110:k= i+b

Q93 Which of the following is the correct High level code for the given TAC in the passage

(A) t1 = y+2
```
init = x/t1;
limit=10;
if(i>j || num>b)
{
   num = limit-1;
   b = y + 2;
   i=i-num;
}
j=i - num;
k = k+b;
```
(B) init = x/(y+2);
```
limit=10;
while(i>j || num>b)
{
   num = limit-1;
   b = y + 2;
   i=i -num;
}
j = i - num;
k = k+b;
```
(C) init = x/(y+2);
```
limit=10;
if(i>j)
{
   While( num>b)
      num = limit-1;
}
else
{
   b = y + 2;
   i=i-num;
}
j= i - num;
k= k+b:
```
(D) init = x/(y+2);
```
limit=10;
while(i>j && num>b)
{
   num = limit-1;
   b=y+2;
   i=i-num;
}
j = i - num;
k = k+b;
```

Q94 What all blocks does Block 3 and Block 5 dominate in the Flow graph for the TAC given in the passage?

(A) Block 3:3 ; Block 5:5
(B) Block 3: 3,4,5,6; Block 5: 5,6
(C) Block 3: 3,7; Block 5: 5,7
(D) Block 3: 3,4,7; Block 5: 5,6,7

Q95 Which of the followings is the correct Flow graph for the TAC given in the passage?

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

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

(C)

$$\begin{bmatrix} 0&1&0&0&0&0 \\ 0&0&1&0&0&0 \\ 1&0&1&0&0&0 \\ 0&1&0&0&0&1 \\ 0&0&0&0&0&1 \\ 0&0&0&0&0&1 \end{bmatrix}$$

(D)

$$\begin{bmatrix} 0&1&0&0&0&0&0 \\ 0&0&0&1&0&1&0 \\ 0&0&0&0&0&0&1 \\ 0&0&1&0&0&1&0 \\ 0&0&0&0&0&0&1 \\ 0&1&0&0&0&0&0 \\ 0&1&0&0&0&0&0 \end{bmatrix}$$

Directions (96-100) Read the following passage and answer the given questions.

Consider the following disc Queue with requests for I/O to block on cylinders:

45, 81, 185, 33, 175, 99, 150, 77

(Consider that the head starts from location 58)

Q96 **What shall be the 2nd request being processed by C-LOOK (Right) disc Scheduling technique for the already given request queue?**

(A) 81 (B) 45

(C) 77 (D) 33

Q97 What shall be the total head movement of cylinders for the C-SCAN disc Scheduling technique if the head starts moving in the right direction from initial position ?

(A) 327 (B) 307

(C) 525 (D) 385

Q98 **What shall be the 2nd request being processed by SCAN (LEFT) disc Scheduling technique for the already given request queue?**

(A) 81 (B) 15

(C) 33 (D) 175

Q99 What will be the total head movement of cylinders for the SSTF disc Scheduling technique?

(A) 160 (B) 124

(C) 177 (D) 240

Q100 What shall be the total head movement of cylinders if the FCFS disc scheduling method is used?

(A) 536 (B) 594

(C) 647 (D) 700

Answer Key

Q1	(C)
Q2	(D)
Q3	(B)
Q4	(B)
Q5	(A)
Q6	(C)
Q7	(A)
Q8	(A)
Q9	(D)
Q10	(B)
Q11	(A)
Q12	(B)
Q13	(D)
Q14	(B)
Q15	(A)
Q16	(A)
Q17	(A)
Q18	(C)
Q19	(C)
Q20	(D)
Q21	(B)
Q22	(D)
Q23	(D)
Q24	(C)
Q25	(D)
Q26	(B)
Q27	(B)
Q28	(C)
Q29	(C)
Q30	(D)
Q31	(C)
Q32	(A)
Q33	(B)
Q34	(C)
Q35	(B)
Q36	(A)
Q37	(B)
Q38	(C)
Q39	(B)
Q40	(B)
Q41	(C)
Q42	(B)
Q43	(A)
Q44	(B)
Q45	(C)
Q46	(B)
Q47	(A)
Q48	(D)
Q49	(B)
Q50	(D)
Q51	(D)
Q52	(C)
Q53	(A)
Q54	(B)
Q55	(D)
Q56	(B)
Q57	(C)
Q58	(A)
Q59	(C)
Q60	(C)
Q61	(C)
Q62	(A)
Q63	(B)
Q64	(A)

Q65 (B)
Q66 (D)
Q67 (D)
Q68 (D)
Q69 (C)
Q70 (A)
Q71 (C)
Q72 (C)
Q73 (C)
Q74 (C)
Q75 (D)
Q76 (C)
Q77 (C)
Q78 (D)
Q79 (C)
Q80 (A)
Q81 (B)
Q82 (C)
Q83 (D)
Q84 (D)
Q85 (B)
Q86 (C)
Q87 (A)
Q88 (C)
Q89 (A)
Q90 (A)
Q91 (D)
Q92 (C)
Q93 (D)
Q94 (A)
Q95 (A)
Q96 (A)
Q97 (D)
Q98 (C)
Q99 (C)
Q100 (C)

Hints & Solutions

Q1 **Text Solution:**
This is a **permutation** problem (order matters, and no replacement).
You are choosing 3 **distinct cards** from 42 **in a specific order**, so:
Number of ways=P(42,3) = 42×41×40
=42×41=1722 then 1722×40 = 68880
Correct Answer: (C) 68880

Q2 **Text Solution:**
Option A: **"The process could issue an I/O request and then be placed in the Ready Queue"**
Incorrect Statement

- If a process issues an I/O request, it is moved to the **Waiting (or Blocked)** queue, **not Ready queue**.
- **Ready Queue** is for processes waiting for CPU **without any I/O pending**.

Option B: **"The process could create new subprocesses & wait for the termination of the subprocesses"**
Correct Statement

- This is valid; a process can use `fork()` or `create()` system call and then perform `wait()` to block itself until child processes finish.

Option C:**"The time slice of the process expires and it may join the waiting queue"**
Incorrect Statement

- If the time slice expires, the process is **preempted** and sent to the **Ready queue**, **not the Waiting queue**.
- **Waiting queue** is only for I/O or other blocking events.

Option D: **"The process is forcibly removed from the CPU and is put in the Waiting queue due to arrival of an interrupt"**
Incorrect Statement

- Interrupts may cause **preemption**, but the process is sent to the **Ready queue**, **unless** the process itself makes a blocking call.
- An interrupt **alone does not move** a process to the **Waiting queue**.

Correct Answer: Option D) A, C and D Only

Q3 **Text Solution:**
Matching List I with List II – Concepts/Technologies

Term	Explanation
A. **Count to infinity problem**	II. Occurs in **Distance Vector Routing algorithms** (e.g., RIP) due to slow convergence.
B. **IEEE 802.16**	III. Standard for **WiMAX** (wireless broadband access).
C. **IEEE 802.15**	IV. Standard for **Bluetooth** (Wireless Personal Area Networks).
D. **AODV protocol**	I. Routing protocol used in **Mobile Ad-hoc Networks (MANETs)**.

Correct Answer: Option B) A-II, B-III, C-IV, D-I

Q4 **Text Solution:**
Average number of processes in system (L) = Arrival rate(λ) × Average waiting time(W)
We are given:

- L=20 (average number of processes in the queue)
- λ=10 processes per second
- Need to find = average waiting time per process

Apply the formula:
$L = \lambda \times W \Rightarrow W = \frac{L}{\lambda} = \frac{20}{10} = 2 \text{ seconds}$
Correct Answer: B**) 02 seconds**

Q5 **Text Solution:**
Statement A: "Agent system comprises of an agent and an environment on which it acts"
Correct

- By definition, an agent interacts with and acts upon an environment.

Statement B: "The controller part of an agent receives percepts from its body and sends commands to the environment"
Correct.

- The **agent receives percepts from sensors** (body), processes them in the **controller (agent program)**, and then **sends actions** to the **actuators**, which affect the **environment**.

Statement C: "Agents act in the world through actuators which are non-noisy and always reliable."
Incorrect

- In real-world AI systems, **actuators can be noisy and unreliable** (e.g., in robotics).
- Assumption of perfect actuators is **not realistic**.

Statement D: "The actuators of an agent convert stimuli into percepts"
Incorrect

- **Sensors**, not actuators, convert stimuli from the environment into **percepts**.
- **Actuators** are used to **act upon** the environment, not to sense it.

Correct statements: A and B only

Q6 **Text Solution:**
The process of transferring data from **main memory** to **cache memory** and deciding **where** in the cache that data will go is called **mapping**.
There are several **cache mapping techniques**:

- **Direct Mapping**
- **Associative Mapping**
- **Set-Associative Mapping**

These determine **how memory blocks are mapped to cache blocks**.
Correct Answer: Option C) Mapping

Q7 **Text Solution:**
C. Choose a task domain: First, you need to know *what area* you're modeling (e.g., medicine, robotics).
A. Selects atoms to represent propositions: Next, you choose **basic symbols (atoms)** that will represent facts or predicates in that domain.
D. Axiomatizing the domain: After you've identified the atoms, you need to **formulate rules (axioms)** that express how these atoms relate logically.
B. Ask questions about intended interpretation: Finally, once the axioms are written, the designer checks whether the knowledge base is **interpreting the real world correctly** by asking semantic/intended meaning questions.
Correct Option: **A) C → A → D → B**

Q8 **Text Solution:**
Outer Loop (i loop):

- i = 1, then i = 3, then i = 5 (condition fails at i = 5)
- So the outer loop runs for i = 1 and i = 3

Inner Loop (j loop):

1. **When i = 1:**

- j = 1; j < 1 → false
- Inner loop **does not run**

2. **When i = 3:**

- j = 1; j < 3 → true → print 1
- j = 3; j < 3 → false → loop ends

Final Output: Only one value is printed: **1**
Correct Answer: Option A) 1

Q9 **Text Solution:**
We are given the Boolean expression:
$A(x,y,z)=x\cdot(y'\cdot z)'$
Simplify using De Morgan's Law:
$(y'\cdot z)'=y+z'$
So: $A=x\cdot(y+z')$
Now distribute: $A=x\cdot y+x\cdot z'$
To find the **complete** sum-of-products, we need all minterms for which A = 1.
Construct Truth Table
We'll find the rows for which A=1, then write minterms.

x	y	z	z′	y + z′	A = x · (y + z′)
0	0	0	1	1	0
0	0	1	0	0	0
0	1	0	1	1	0
0	1	1	0	1	0
1	0	0	1	1	1
1	0	1	0	0	0
1	1	0	1	1	1
1	1	1	0	1	1

Rows where A = 1:

x	y	z	Minterm
1	0	0	x·y′·z′
1	1	0	x·y·z′
1	1	1	x·y·z

Correct Answer: Option D) xyz + xyz′ + xy′z′

Q10 **Text Solution:**

A. **Reliability → II**

- Ability of the software to perform **consistently** under specified conditions for a defined period.

B. **Efficiency → III**

- Concerned with **performance vs. resource usage** (CPU time, memory, etc.).

C. **Maintainability → IV**

- Effort required to **modify** the software for fixes or enhancements.

D. **Portability → I**

- Ease of **transferring** software across different environments.

Correct Answer: Option B) A → II, B → III, C → IV, D → I

Q11 **Text Solution:**

Matching of Memory Concepts – List I with List II

List I: Memory System Components	Explanation
A. Address Space	Address Space refers to the range of addresses a program can use, generated by the CPU. These are also known as **virtual/logical addresses**. Hence, A matches **IV**.
B. Memory Space	Memory space refers to the actual **physical memory locations** in the system where data resides. **Physical addresses** are used to access these locations. So, B matches **III**.
C. Cache Memory	Cache is a small, fast memory used for speeding up data access. **Associative mapping** is one method used in cache memory where any block of memory can be mapped to any cache line. So, C matches **I**.
D. Segmented Program	In segmented memory, a program is divided into **segments** (code, data, stack). The CPU generates **logical addresses** as (segment number, offset), which are mapped to physical addresses. So, D matches **II**.

Correct Option: A) A-IV, B-III, C-I, D-II

Q12 **Text Solution:**

A. **Digital Signature → II. Confirms authenticity and integrity**

- Digital signatures are used to **verify the sender** (authenticity) and that the message hasn't been altered (integrity).

B. **Hash Function → III. Produces a fixed-size digest**

- A hash function (e.g., SHA-256) converts variable-length input into a **fixed-length output (digest)**.

C. **AES (Advanced Encryption Standard) → IV. Symmetric encryption algorithm**

- AES is a **symmetric-key** algorithm: same key for encryption and decryption.

D. **RSA → I. Asymmetric encryption algorithm**

- RSA uses a **public-private key pair**, so it's an **asymmetric** encryption technique.

Correct Answer: Option B) A-II, B-III, C-IV, D-I

Q13 **Text Solution:**

For any 3D array ar, the equivalent pointer expression is: ***(*(*(ar + m) + n) + 0)**

- ar is a pointer to a 2D array.
- ar + m moves to the m-th block (1st dimension),
- *(ar + m) gives a pointer to the m-th 2D array.
- *(ar + m) + n moves to the n-th row (2nd dimension).
- *(*(ar + m) + n) gives a pointer to the n-th 1D array.

- Finally, adding + 0 and dereferencing gives the element at index 0 in that row.

Correct Answer: Option D) ∗(∗(∗(ar+m)+n)+o)

Q14 **Text Solution:**

We need to identify the grammar that is context-free but not regular — that is, the grammar must belong to the class of context-free grammars and not to the class of regular grammars.

Grammar C:

S → AS

S → aA

A → a

- All rules are in CFG form
- Rule S → AS is **not regular** (non-terminal on both sides or in front)
  Only Context-Free (Not Regular)

Grammar D:

S → Ab

S → aA

A → a

- All rules are in CFG form
- S → Ab is **not regular** (non-terminal appears **after** terminal)
  Only Context-Free (Not Regular)

Correct grammars that are *only* Context-Free (not Regular): C, D only

Q15 **Text Solution:**

From the given header: CB84 000D 001C 001C

UDP Header Format:

The UDP header is **8 bytes** (4 fields, 2 bytes each):

Bytes	Field
Bytes 0-1	Source Port
Bytes 2-3	Destination Port
Bytes 4-5	Length
Bytes 6-7	Checksum

- **Source Port:** `CB84`
- **Destination Port:** `000D`
- **Length:** `001C`
- **Checksum:** `001C`

First 2 bytes = CB84

Convert this **hexadecimal (CB84) to decimal**:

$= C \times 16^3 + B \times 16^2 + 8 \times 16^1 + 4 \times 16^0$

$= 12 \times 4096 + 11 \times 256 + 8 \times 16 + 4$

$= 49152 + 2816 + 128 + 4$

= **52100**

Source Port = 52100

Correct Answer: Option A) 52100

Q16 **Text Solution:**

A. **Worst Individual → III**

- If we base termination on the **worst individual's fitness**, we ensure that the **entire population** is at a certain **minimum standard**.

B. **Best Individual → IV**

- Termination on the **best individual** ensures **faster convergence**, guaranteeing that **at least one solution** is optimal or near-optimal.

C. **Sum of Fitness → II**

- When the **sum of fitness** values stabilizes or reaches a threshold, it means that **most individuals fall within a narrow fitness range**.

D. **Median Fitness → I**

- If the **median fitness** reaches a value, it means that **at least half** the population has **equal or better fitness** than the convergence value.

Correct Answer: Option A) A → III, B → IV, C → II, D → I

Q17 **Text Solution:**

We want all eids such that for every cid in Comp, there exists a tuple in Own with that eid and cid.

This is the definition of relational **division**:

Own(eid, cid)÷Comp(cid)=eids who own all cids

Correct Answer: Option A)

πeid(πeid,cid(Own)÷πcid(Comp))

Q18 **Text Solution:**

Reverse Engineering is the process of **analyzing** a software system to discover its components and internal design **without having access to the original source code or design documentation**.

It is typically used when:

- The original source code or documentation is missing.
- You need to understand legacy systems.

- You want to discover hidden or unknown aspects of the system.

Correct Answer: Option C) Reverse Engineering

Q19 **Text Solution:**

Layered File System Structure (Top to Bottom):

E. Application Programs: Programs that request file operations (e.g., editors, compilers).

A. Logical File System: Manages metadata, file permissions, directories.

B. File Organization Module: Maps logical blocks to physical blocks, manages file records.

C. Basic File System: Issues generic commands to the device driver.

D. I/O Control: Includes device drivers and interrupt handlers to perform I/O.

Correct Answer: Option C) E → A → B → C → D

Q20 **Text Solution:**

A. Software does not wear out

True – Software does not degrade physically like hardware. Failures are usually due to bugs or environmental changes, not wear and tear.

B. Software is flexible

True – Software can be modified easily to meet changing requirements.

C. Software is not manufactured

True – Software is developed, not manufactured like physical products.

D. Software is always correct

False – This is **not** a valid characteristic. Software often contains bugs, errors, or design flaws. It needs testing, verification, and validation. So, it is **not always correct**.

Correct Answer: Option D) Software is always correct

Q21 **Text Solution:**

Cohesion is a measure of how strongly related the responsibilities of a single module are. Higher cohesion = Better software design.

Cohesion Levels (Best to Worst):

High Cohesion (Better)

Functional Cohesion ← A
↓
Sequential Cohesion ← B
↓
Communicational Cohesion ← D
↓
Procedural Cohesion ← Reference Point (Base Line in Question)
↓
Temporal Cohesion ← C (Worse)
↓
Logical Cohesion ← E (Worse)
↓
Coincidental Cohesion ← Worst

Low Cohesion (Worse)

Correct Answer: Option B) A, B and D Only

Q22 **Text Solution:**

Infix: ((A + B) * D) ↑ (E - F)

We need to follow **operator precedence** and **associativity**.

Operator Precedence (Highest to Lowest):

Note: First, we will solve the brackets, and after that, we will solve it using Operator Precedence.

1. ↑ (Exponentiation) – **Right to Left**
2. * (Multiplication) – **Left to Right**
3. +, - (Addition/Subtraction) – **Left to Right**

Conversion Steps:

1. **(A + B)** → AB+
2. Then, (AB+) * (D) → AB+D*
3. **(E - F)** → EF−
4. Finally, the exponentiation: (AB+D*) ↑ (EF−) → AB+D*EF−↑

Correct Answer: Option D) AB+D*EF−↑

Q23 **Text Solution:**

A. Binary Search Tree (BST)

- **Not necessarily height-balanced**
- A BST can become skewed (like a linked list) in worst case → height = O(n)
- So, **not guaranteed to be height-balanced**

B. AVL Tree

- **Yes, it is height-balanced**

- Strictly enforces that height difference (balance factor) between left and right subtrees is at most 1
- So, always maintains height O(logn)

C. Red-Black Tree

- Yes, **it is a height-balanced tree** (but less strictly than AVL)
- Ensures no path is more than **twice as long** as any other, i.e., guarantees logarithmic height
- So, **yes, height-balanced**

D. B Tree

- Yes, it is also height-balanced
- All leaf nodes appear at the **same level**
- Mostly used in disk-based databases and file systems

Correct Answer: Otpion D) B, C and D Only

Q24 **Text Solution:**
Bandwidth-Delay Product = **Bandwidth (in bits/sec)** × **Round-Trip Time (in seconds)**
It represents the **maximum number of bits that can be in transit on the link at any time.**
Given:

- $\text{Bandwidth } = 1\text{Mbps} = 1 \times 10^6 \text{ bits} / \text{sec}$
- $\text{Round-trip time } = 30 \text{ ms} = 30 \times 10^{-3} \text{ sec}$

$\boldsymbol{BDP = 1 \times 10^6 \times 30 \times 10^{-3} = 30,000 \text{ bits}}$
Correct Answer: Option C) 30,000 bits

Q25 **Text Solution:**
McCall's Quality Model:
McCall's model defines **11 software quality factors** categorized into three perspectives:
1. **Product Operation:**

- Correctness
- **Usability** *(B)*
- **Integrity** *(C)*
- Reliability
- Efficiency

2. **Product Revision:**

- **Maintainability** *(A)*
- Flexibility
- Testability

3. **Product Transition:**

- Portability
- Reusability
- Interoperability

Functionality is **not** one of McCall's original 11 quality factors
Correct Answer: Option **D) A, B and C Only**

Q26 **Text Solution:**
A. Hypervisor installed on physical server
→ The **hypervisor** is the core component that enables virtualization by managing multiple virtual machines on a single physical machine.
B. Virtual machines created
→ Once the hypervisor is in place, you can create **VMs (Virtual Machines)** on top of it.
C. Resources allocated to Virtual machines
→ Each VM is assigned specific **CPU, memory, storage, and network** resources.
D. Virtual machines run isolated workloads
→ The VMs now **run applications** or services independently and in isolation.
Correct Answer: Option B) A, B, C, D

Q27 **Text Solution:**
Inclusion-Exclusion Principle:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Count of numbers divisible by 2:

$$\left\lfloor \frac{200}{2} \right\rfloor = 100$$

Count of numbers divisible by 5:

$$\left\lfloor \frac{200}{5} \right\rfloor = 40$$

Count of numbers divisible by both 2 and 5 (i.e., by 10):

$$\left\lfloor \frac{200}{10} \right\rfloor = 20$$

Now apply Inclusion-Exclusion:

$$\text{Count divisible by 2 or 5} = 100 + 40 - 20 = 120$$

$$\text{Probability} = \frac{120}{200} = \frac{3}{5}$$

Correct Answer: Option B) 3 / 5

Q28 **Text Solution:**

Correct Matching:

List I (Statement)	Meaning	Matches With
A. If the Indian team wins, then it is raining	P → Q : **Conditional**	**IV**
B. If the Indian team does not win, then it is not raining	¬P → ¬Q : **Inverse**	**I**
C. If it is raining, then the Indian team wins	Q → P : **Converse**	**II**
D. If it is not raining, then the Indian team does not win	¬Q → ¬P : **Contrapositive**	**III**

Q29 **Text Solution:**

To convert the hexadecimal number $(A0F)_{16}$ to its binary equivalent, each hexadecimal digit is converted to its 4-bit binary representation.

Hex: A 0 F
↓ ↓ ↓
Binary: 1010 + 0000 + 1111
= 101000001111

Therefore, the binary equivalent of $(A0F)_{16}$ is **101000001111**.

Correct Answer: **Option C) 101000001111**

Q30 **Text Solution:**

In **Linux interrupt handling**, there is a clear **hierarchy of priority levels**:

1. **User Mode Programs (A)** – Have the **lowest priority**, can be **preempted** at any time by kernel or interrupts.
2. **Kernel System Service Routines (D)** – Run in kernel mode, but are still **preemptible** by interrupt handlers.
3. **Bottom Half Interrupt Handlers (B)** – These are **deferred interrupt handlers** (e.g., softirqs, tasklets); they run after the top half completes.
4. **Top Half Interrupt Handlers (C)** – **Highest priority**. Executed immediately when an interrupt occurs. Cannot be preempted by anything except another (higher) interrupt.

Correct Answer: Option D) A → D → B → C

Q31 **Text Solution:**

Sutherland–Cohen is a classic **line clipping algorithm** used in computer graphics.

- It is designed to **clip line segments** against a **rectangular clipping window**.
- The algorithm uses **region codes** (called outcodes) for the endpoints of the line.
- These outcodes help determine:
  - If the line is **completely inside** the clipping window → accept it.
  - If the line is **completely outside** → reject it.
  - If the line is **partially inside** → calculate the **intersection points** and clip the line accordingly.

Correct Answer: **C) Sutherland-Cohen**

Q32 **Text Solution:**

Effort Estimation for Organic Mode:

$$E = 2.4 \times (\text{KLOC})^{1.05}$$
$$\text{PM (Person-Months)}$$

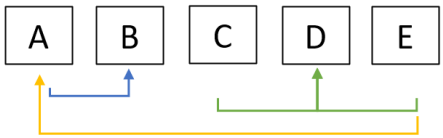
- **E** = Effort in Person-Months
- **KLOC** = Thousands of Lines of Code
- **2.4** and **1.05** are empirical constants for **Organic** software

Correct Answer: (A) E = 2.4 × (KLOC)^1.05 PM

Q33 **Text Solution:**

Relation: R(A, B, C, D, E)

Functional Dependencies (FDs):



Now $EC^+ = \{A, B, C, D, E\}$

Covers all attributes in R → **EC is a candidate key**

Correct Answer: **Option B) EC**

Q34 **Text Solution:**

(a) If she is intelligent, then she is unhappy.

- This is: **P → ¬Q** (If P, then not Q)

(b) She is neither intelligent nor happy.

- "Neither P nor Q" means: **¬P ∧ ¬Q**

(c) It is necessary to be not intelligent in order to be happy.

- **If Q (she is happy), then she must be not intelligent ⇒ Q → ¬P**

(d) To be not intelligent is to be unhappy.

- **If she is not intelligent, then she is not happy ⇒ ¬P → ¬Q**

Correct Answer: Option C) P → ¬Q, ¬P ∧ ¬Q, Q → ¬P, ¬P → ¬Q

Q35 **Text Solution:**

We are asked to find:

Number of people who eat **at least one of the three** items

→ This is n(R∪B∪C)

Formula:

$$n(R \cup B \cup C) = n(R) + n(B) + n(C) - n(R \cap B) - n(R \cap C) - n(B \cap C) + n(R \cap B \cap C)$$

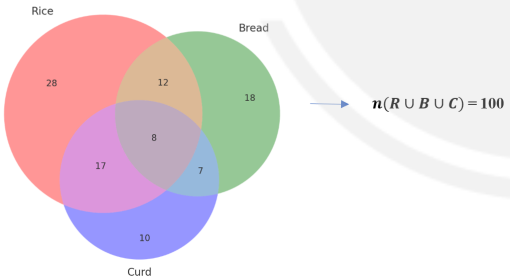
Plug in the values:

$= 65 + 45 + 42 - 20 - 25 - 15 + 8 = 152$

$- 60 + 8 = 100$

Alternate Method (Venn Diagram Approach):

Venn Diagram:



Correct Option: **Option B) 100**

Q36 **Text Solution:**

Training samples (S1 to S4):

Sample	x1	x2	Target
S1	0	0	0
S2	0	1	1
S3	1	0	1
S4	1	1	1

Activation function:

$$y\_observed = \begin{cases} 1, & \text{if } y_{in} > 0 \\ 0, & \text{if } y_{in} < 0 \end{cases}$$

Apply Perceptron Learning Rule:

$w_i^{\text{new}} = w_i^{\text{old}} + \eta \cdot (t - y) \cdot x_i$

Initial Weights: $w_1 = 0$, $w_2 = 0$

Sample S1: $x_1 = 0, x_2 = 0, t = 0$

- $y_{in} = 0 * 0 + 0 * 0 = 0 \rightarrow y = 0$
- Error = $t - y = 0 - 0 = 0$
- No weight update

  → $w_1 = 0.0, w_2 = 0.0$

Sample S2: $x_1 = 0, x_2 = 1, t = 1$

- $y_{in} = 0 * 0 + 0 * 1 = 0 \rightarrow y = 0$
- Error = $1 - 0 = 1$
- Update:
  - $w_1 = 0 + 0.1 * 1 * 0 = 0.0$
  - $w_2 = 0 + 0.1 * 1 * 1 = 0.1$

→ $w_1 = 0.0, w_2 = 0.1$

Sample S3: $x_1 = 1, x_2 = 0, t = 1$

- $y_{in} = 0.0 * 1 + 0.1 * 0 = 0.0 \rightarrow y = 0$
- Error = $1 - 0 = 1$
- Update:
  - $w_1 = 0.0 + 0.1 * 1 * 1 = 0.1$
  - $w_2 = 0.1 + 0.1 * 1 * 0 = 0.1$

→ $w_1 = 0.1, w_2 = 0.1$

Sample S4: $x_1 = 1, x_2 = 1, t = 1$

- $y_{in} = 0.1 * 1 + 0.1 * 1 = 0.2 \rightarrow y = 1$
- Error = $1 - 1 = 0$
- No update

→ Final weights: $w_1 = 0.1, w_2 = 0.1$

Correct Answer: Option A) $w_1 = 0.1$, $w_2 = 0.1$

Q37 **Text Solution:**

Dijkstra's Algorithm – Greedy

Selects the nearest unvisited node to find the shortest path (works with non-negative weights).

Kruskal's Algorithm – Greedy

Chooses the minimum-weight edge that doesn't form a cycle (for Minimum Spanning Tree).

Huffman Coding – Greedy

Repeatedly combines the two least frequent symbols to build an optimal prefix code.

Bellman-Ford – Not Greedy

Uses **dynamic programming** to handle negative weights.

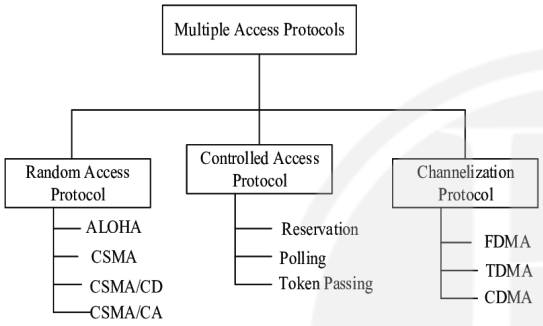
Correct Answer: Option B) A, B, and C Only

Q38 **Text Solution:**
Choke Packet

- A **choke packet** is a special control packet sent **by a router to the source** to **notify congestion** in the network.
- It is an **explicit congestion notification** mechanism.

Correct Answer: Option C) Choke

Q39 **Text Solution:**
Controlled-access protocols allow **only one node to access the shared channel at a time** — they **control who can transmit**, avoiding collisions.

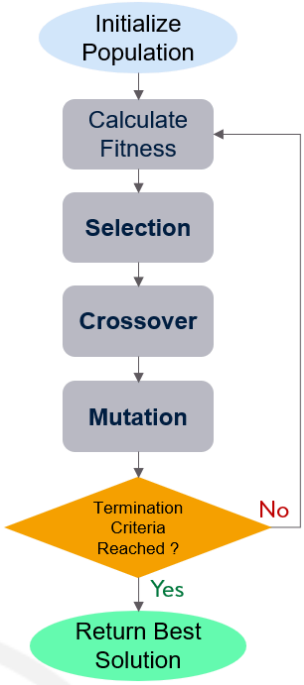


Hence, controlled-access protocols are :

- **Reservation:** Time slots are **reserved in advance** for specific stations to transmit.
- **Polling:** A **central controller polls** each device to check if it wants to transmit.
- **Token Passing:** A **token circulates** in the network; only the station with the token can transmit.

Correct Answer: Option B) A, B and D Only

Q40 **Text Solution:**
Standard Order of Steps in a Genetic Algorithm:



Hence, correct order is : Fitness Calculation → Parent Selection → Crossover → Mutation
Correct Answer: Option B) C → A → D → B

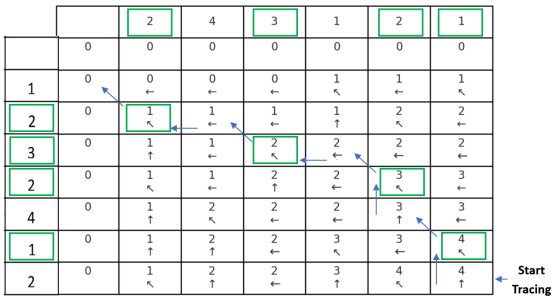
Q41 **Text Solution:**
We are given two sequences:

- **X = {1, 2, 3, 2, 4, 1, 2}**
- **Y = {2, 4, 3, 1, 2, 1}**

LCS table (dp[i][j] = LCS length of X[0..i-1] and Y[0..j-1]):

		2	4	3	1	2	1
	0	0	0	0	0	0	0
1	0	0 ←	0 ←	0 ←	1 ↖	1 ←	1 ↖
2	0	1 ↖	1 ←	1 ←	1 ↑	2 ↖	2 ←
3	0	1 ↑	1 ←	2 ↖	2 ←	2 ←	2 ←
2	0	1 ↖	1 ←	2 ↑	2 ←	3 ↖	3 ←
4	0	1 ↑	2 ↖	2 ←	2 ←	3 ↑	3 ←
1	0	1 ↑	2 ↑	2 ←	3 ↖	3 ←	4 ↖
2	0	1 ↖	2 ↑	2 ←	3 ↑	4 ↖	4 ↑

The **length of LCS = 4**
Now trace back from dp[7][6] = 4 to find actual LCS: We'll follow the ↖ diagonal arrows only when characters match in both sequences:



LCS order: → 2, 3, 2, 1

Final Answer: (C) 2, 3, 2, 1

Q42 **Text Solution:**

Statement A: Correct

Data transformation **is** part of data preprocessing in the data mining process.

Statement B: Incorrect

A **data warehouse** does **not** use an "online database" in the usual sense (OLTP).

It uses **OLAP systems**, and usually stores **historical, analytical data**, not online operational data.

So, **B is wrong**.

Statement C: Incorrect

Classification is a technique, not a measure of accuracy.

Accuracy is an evaluation metric **for** classification.

Statement D: Correct

K-means minimizes **within-cluster variance**.

Statement E: Correct

Pattern evaluation selects the best patterns based on **interestingness measures** like support, confidence.

Correct Answer: **Option B) A, D, E only**

Q43 **Text Solution:**

A. **Equivalence Partitioning → II**

- This **black-box** testing technique divides input data into **valid and invalid equivalence classes**.

B. **Boundary Value Analysis → III**

- Focuses on **testing at the edges (boundaries)** of input ranges.

C. **Cyclomatic Complexity → I**

- A **white-box** testing metric that counts **independent paths** through the code.

D. **Decision Table Testing → IV**

- Uses a **table of conditions and actions**, testing various **combinations**.

Correct Option: A) A-II, B-III, C-I, D-IV

Q44 **Text Solution:**

Convert decimal to binary

Decimal 8 → Binary = 1000

Gray Code Rule:

- The **first (MSB)** bit remains the **same**.
- Each subsequent bit is obtained by **XOR-ing** the **current bit** with the **previous bit** in the binary number.

Binary: 1 0 0 0

- First bit: 1
- 2nd bit: 1 XOR 0 = 1
- 3rd bit: 0 XOR 0 = 0
- 4th bit: 0 XOR 0 = 0

Correct Answer: B) **1100**

Q45 **Text Solution:**

Explanation and Matching:

Method	Correct Match	Explanation
A. Chaining	**III**	Uses a **linked list at each index** to store multiple values with the same hash
B. Linear Probing	**I**	If a collision occurs, **check the next slot** (i+1, i+2...) sequentially
C. Quadratic Probing	**IV**	Skips slots using a **quadratic formula** like $i + 1^2$, $i + 2^2$...
D. Double Hashing	**II**	Uses a **second hash function** to compute step size and avoid clustering

Correct Option: C) A-III, B-I, C-IV, D-II

Q46 **Text Solution:**

Read Operation:

- Transfers data **from I/O device → to main memory or CPU**.

Example: Reading from keyboard, reading a file from disk.

Write Operation:

- Transfers data **from CPU (or memory) → to the I/O device**.
  Example: Sending output to printer, writing a file to disk.

Therefore, option B accurately describes the function of a write operation in I/O.
Correct Answer: Option B

Q47 **Text Solution:**
In Genetic Algorithms (GAs), **parent selection techniques** determine which individuals (solutions) get to reproduce and pass their genes to the next generation. Common techniques include:
Common Parent Selection Techniques:

1. **Tournament Selection:** Selects a few individuals randomly and picks the best among them.
2. **Rank Selection:** Individuals are ranked, and selection is based on rank rather than raw fitness.
3. **Boltzmann Selection:** Similar to simulated annealing; uses a probabilistic function that changes with "temperature".

Radial Selection: No standard algorithm or GA literature defines a "radial" selection.
Correct Answer: **Option A) Radial**

Q48 **Text Solution:**
Adjacency Matrix:

- A **2D array** (matrix) used to represent **edges between vertices**.
- Best suited for **dense graphs**.
- Each cell `[i][j]` in the matrix indicates whether there's an edge between vertex `i` and vertex `j`.
- This representation uses **sequential memory** (arrays), not pointers.

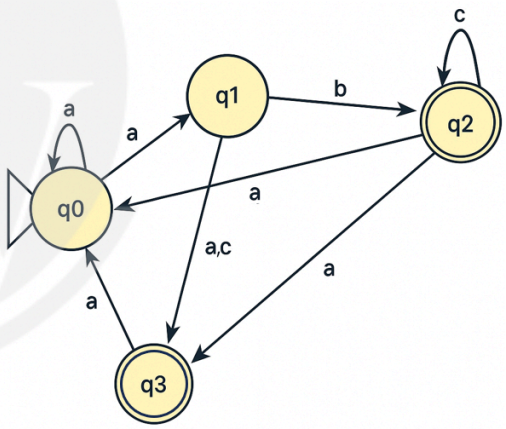
Hence, it is referred to as a **Sequential Representation**.
Correct Answer: **Option D) Sequential Representation**

Q49 **Text Solution:**
Explanation and Matching:

Queue Type	Correct Match	Explanation
A. Circular Queue	**II**	Used in **CPU scheduling** (Round Robin algorithm) where queue wraps around
B. Priority Queue	**III**	Used in **Dijkstra's algorithm** for selecting minimum cost vertex
C. Double Ended Queue	**IV**	Supports insertion/deletion from both ends — useful in **palindrome checking**
D. Simple Queue	**I**	Standard FIFO used in **print queues** and task queues

Correct Option: **B)– A-II, B-III, C-IV, D-I**

Q50 **Text Solution:**
Let's analyze the NFA given in Option D,



NFA Transition Table:

State	a	b	c
q0	q0, q1	-	-
q1	q3	q2	q3
q2 (final)	q0, q3	-	q2
q3 (final)	q0	-	-

Subset Construction for DFA States: We build DFA states as **sets of NFA states**.

DFA Transition Table:

From DFA	a	b	c
{q0}	q0, q1	-	-
{q0, q1}	q0, q1, q3	q2	q3
{q0, q1, q3}	q0, q1, q3	q2	q3
{q2}	q0, q3	-	q2
{q3}	q0	-	-
{q0, q3}	q0, q1	-	-

Cover all possible states

DFA States: {q0} → **q0**, {q0, q1} → **q1**, {q0, q1, q3} → **q2**, {q2} → **q3**, {q3} → **q4,** {q0, q3} → **q5**

Any state containing q2 or q3 is final. So:

Final DFA states are: {q0, q1, q3} → **q2**, {q2} → **q3**, {q3} → **q4,** {q0, q3} → **q5**

Hence, the DFA given in the question is correctly represented by the NFA shown in Option D. This means that the NFA in Option D is the correct equivalent of the given DFA.

Q51 Text Solution:

Logic Gates Output Table for Inputs (0, 0)

Gate Name	Input 1	Input 2	Output
NAND	0	0	1
NOR	0	0	1
XOR	**0**	**0**	**0**
XNOR	0	0	1

Therefore, the only gate listed that does *not* give an output of 1 when both inputs are 0 is the **X-OR gate**.

Correct Answer: Option D) C Only

Q52 Text Solution:

1) Candidate Key(s) for T1 = {A, B, C, D, E}.

$DA^+ = \{D, A, E, B, C\}$

Check if T1 is in 3NF

1. **EB → C**
   - EB is **not a superkey**
   - C is **not prime** (candidate key is DA ⇒ only D and A are prime)
   ⇒ **Violates 3NF**
2. **D → E**
   - D is not a superkey
   - E is not prime
   ⇒ **Violates 3NF**
3. **EA → B**
   - EA is not a superkey
   - B is not prime
   ⇒ **Violates 3NF**

So, **T1 is NOT in 3NF**

Check 2NF for T1

A relation is in **2NF** if:

- It is in **1NF**, and
- **No partial dependency exists** (i.e., no non-prime attribute depends on a **proper subset of candidate key**)

Candidate key = DA

Let's analyze the dependencies:

- D → E partial dependency (**D** is a **proper subset** of DA, and E is non-prime)
  ⇒ **2NF is violated**

So, **T1 is NOT in 2NF**

2) Candidate Key(s) for T2(A, B, C, D):

- $C^+ = \{C, A, B, D\}$

Now check 3NF:

1. C → A
   - C is a **superkey**
2. A → B
   - A is not a superkey
   - B is not a prime attribute
   ⇒ **Violates 3NF**

So **T2 is not in 3NF**

Correct Option: C) T1 is not in 3NF

Q53 Text Solution:

Option (A): If $(xy)^2 = x^2y^2$,

then → $xyxy = xxyy$

This implies → $yx = xy$,
So G is commutative (abelian).
Option (B): If $x^3 = 1$ for all $x \in G$,
It does not guarantee commutativity.
There are non-abelian groups where every element has order 3.
Option (3): If $x^5 = 1$ for all $x \in G$,
Still doesn't ensure that G is commutative.
Option (4): If G is commutative, **every subgroup** of G is also commutative.
This statement is also **false**.
Correct Answer: Option A

Q54 **Text Solution:**
Initial: x = 128, y = 110

- Iteration 1: x > y ⇒ x = 128 - 110 = 18
- Now: x = 18, y = 110
- Iteration 2: y > x ⇒ y = 110 - 18 = 92
- Iteration 3: y > x ⇒ y = 92 - 18 = 74
- Iteration 4: y > x ⇒ y = 74 - 18 = 56
- Iteration 5: y > x ⇒ y = 56 - 18 = 38
- Iteration 6: y > x ⇒ y = 38 - 18 = 20
- Iteration 7: y > x ⇒ y = 20 - 18 = 2
- Iteration 8: x > y ⇒ x = 18 - 2 = 16
- Iteration 9: x > y ⇒ x = 16 - 2 = 14
- Iteration 10: x = 14 - 2 = 12
- Iteration 11: x = 10
- Iteration 12: x = 8
- Iteration 13: x = 6
- Iteration 14: x = 4
- Iteration 15: x = 2
- Now: x = y = 2 → loop ends.

Final value printed: printf("%d", x);
Correct Option: B) 2

Q55 **Text Solution:**
Steps involved when you enter a URL in a browser to access a website, in the correct order:
C. URL entered in the browser → User action
A. DNS resolution → Browser queries DNS to resolve domain name
D. IP address obtained → DNS returns IP address of the server
B. HTTP request sent → Browser sends request to server at IP address
E. Webpage displayed → Server sends back response, browser renders page

Correct Answer: Option D) C, A, D, B, E

Q56 **Text Solution:**
A. Clustered Page Table → III (Useful for Sparse address spaces)

- In **clustered page tables**, each entry represents **multiple pages**, not just one.
- This **reduces the size** of the page table when virtual memory is **sparsely populated**.
- **So, it is useful for sparse address spaces.**

B. Hierarchical Page Table → I (Inappropriate for 64-bit)

- In **hierarchical page tables**, each level points to another page table.
- With **64-bit address spaces**, you need **many levels**, which increases overhead.
- **Hence, not ideal for 64-bit systems.**

C. Segmentation → IV (Supports a user view of the system)

- **Segmentation** divides memory into **logical units** like code, data, stack.
- This matches how users/programmers view memory.
- **So, it supports a user-friendly memory model.**

D. Inverted Page Table → II (One entry per physical page/frame)

- Unlike normal page tables (which have an entry for **each virtual page**),
- **Inverted page tables** have entries for **each physical frame only**, saving memory.
- **So, it stores only one entry per real page of memory.**

Correct Option: B) A→III, B→I, C→IV, D→II

Q57 **Text Solution:**
Correct Matching:

Term	Explanation
A. Overloading	Using the same function name with different parameter lists. It is resolved at **compile time**. → **Compile-time polymorphism**
B. Early	Function call is resolved at **compile time** → Faster execution

Binding	
C. Overriding	Subclass provides specific implementation of a method already defined in superclass → **Run-time polymorphism**
D. Late Binding	Function call is resolved at **run time**, e.g., via virtual functions → Slower execution

Correct Answer: Option C) **A–III, B–II, C–IV, D–I**

NOTE: The original question was deleted by UGC because the correct answer was not included in the given options. To address this issue, we have modified the options for this question to ensure accuracy and alignment with the correct solution.

Q58 **Text Solution:**

A. The name refers to busy waiting semaphores → Correct.

- **Spinlocks** use **busy-waiting** (i.e., they continuously check a condition in a loop while holding CPU cycles), hence the term "spinning."
- They don't block or sleep the process.

B. They are not useful when the locks are to be held for a short duration of time → Incorrect

- Spinlocks **are** useful for **short-duration locks**, because avoiding context switches in such cases is more efficient than sleeping/waking.

C. It may require multiple context switches when a process waits on a lock → Incorrect

- Spinlocks **avoid** context switches; that's why they're used for short wait times.
- This statement applies more to **blocking semaphores**, **not** spinlocks.

D. They are often employed on Uniprocessor systems → Incorrect

- On **Uniprocessor systems**, spinlocks are **inefficient**, because spinning wastes CPU cycles and no other process can release the lock while it's spinning.
- Spinlocks are **better suited to multiprocessor systems**.

Correct Answer: Option A Only

Q59 **Text Solution:**

A. The number of tags decreases and users can define their own tags: This statement is considered **true** primarily because **users can define their own tags**, which is a key feature of XML.
However, the part "*the number of tags decreases*" is **not necessarily true** — it depends on the structure and purpose of the application. So, this part is **partially correct**.
B. Its is used for Presentation: This statement is **False**. XML is used for **data representation and transport**, **not** for presentation. Presentation is handled by technologies like HTML and CSS.
C. It is case sensitive. This statement is **True**. XML tags and attributes are case-sensitive.
D. It is dynamic. This statement is considered **true** because XML is **flexible and extensible**. It is called "dynamic" in the sense that users can define and structure data based on their needs.
Correct Answer: **Option C)** A, C, D Only

Q60 **Text Solution:**

Matching of Fuzzy Set Operations with Their Descriptions

List I (Operations on Fuzzy Sets)	Description	Mathematical Expression	Match with List II
A. Intersection	Minimum of membership values	$\mu_{A\cap B}(x) = \min(\mu_A(x), \mu_B(x))$	**IV**
B. Bounded Sum	Minimum of 1 and sum of memb	$\mu_{A\oplus B}(x) = \min(1, \mu_A(x) + \mu_B(x))$	**III**

List I (Operations on Fuzzy Sets)	Description	Mathematical Expression	Match with List II
	ership values		
C. Bounded Difference	Maximum of 0 and difference of membership	$\mu_{A\odot B}(x) = \max(0, \mu_A(x) - \mu_B(x))$	II
D. Algebraic Sum	Sum minus product of membership values	$\mu_{A+B}(x) = \mu_A(x) + \mu_B(x) - \mu_A(x) \cdot \mu_B(x)$	I

Q61 **Text Solution:**

(A) **Data is broken into packets: True** – This is a **core feature** of packet switching.

(B) **Each packet may take a different route: True** – Packets are routed independently, possibly taking different paths.

(C) **Requires a dedicated path: False** – **Circuit switching** (not packet switching) requires a **dedicated path**.

Packet switching is **connectionless or connection-oriented**, but **does not need a dedicated path**.

(D) **Supports dynamic routing: True** – Packet switching supports **dynamic routing** based on network conditions.

Correct Answer: Option C

Q62 **Text Solution:**

Time to Transfer 15 MB once:

$$\text{Time} = \frac{\text{Data Size}}{\text{Transfer Rate}} = \frac{15}{30} = 0.5 \text{ sec}$$

Since swap **in + out** happens:

$$\text{Total Transfer Time} = 0.5 \times 2 = 1.0 \text{ sec}$$

Total Latency (1 for in + 1 for out):

$$\text{Latency} = 2 \times 0.012 = 0.024 \text{ sec}$$

Total Swap Time = Transfer Time + Latency:

$$1.0 + 0.024 = \boxed{1.024 \text{ sec}}$$

Correct Answer: Option A – 1.024 sec

Q63 **Text Solution:**

Explanation and Matching:

Projection	Correct Match	Explanation
A. Oblique Projection	IV	Projectors are **not perpendicular** to projection plane → angle ≠ 90°
B. Cavalier Projection	II	Special case of oblique projection → **no foreshortening** of perpendicular lines
C. Cabinet Projection	I	Another oblique projection where lines **perpendicular are foreshortened** (half scale)
D. Orthographic Projection	III	Projectors are **perpendicular** to projection plane → true orthographic

Correct Option: **B) A-IV, B-II, C-I, D-III**

Q64 **Text Solution:**

Explanation and Matching:

RAID Level	Correct Match	Why?
A. RAID Level 2	IV	Uses **Hamming code** style **error correcting** bits → called *memory-style ECC organization*.
B. RAID Level 3	III	Uses **bit-level striping** with a **dedicated parity disk** → *bit-interleaved parity*.

RAID Level	Correct Match	Why?
C. RAID Level 5	I	Uses **block-level striping** with **distributed parity** → *block interleaved distribution parity.*
D. RAID Level 6	II	Uses **two independent parity functions (P + Q)** → *P+Q redundancy scheme.*

Correct Option: **A) A→IV, B→III, C→I, D→II**

Q65 **Text Solution:**

- a = 12 + 2 = 14
- b = 14 / 2 = 7
- a = 14 * 7 = 98
- b = 98 - 7 = 91 → **This is the value assigned to c**

So, c = 91
Then:
i = &c;
printf("%d", --(*i));

- *i = c = 91
- --(*i) decrements the value at address of c → c = 90
- Then prints 90

Correct Option: **(B) 90**

Q66 **Text Solution:**
A. Interviews: It is a common requirement elicitation technique.
Used to gather information directly from stakeholders.
B. The Use Case Approach: It is a requirement elicitation technique.
Use cases help capture **functional requirements** by describing how users interact with the system.
C. Facilitated Application Specification Technique (FAST) : It is a valid elicitation technique.
Involves joint discussions among stakeholders and developers to gather requirements collaboratively.
D. Data Flow Diagram (DFD): Not an elicitation technique.
DFDs are used **after elicitation**, in **requirement analysis/modeling** to represent system processes and data flow.
Correct Answer: Option D – Data Flow Diagram

Q67 **Text Solution:**
SJF Gantt Chart:
| P3 | P4 | P1 | P5 | P2 |
0 4 12 21 32 62
SJF Finishing Order: P3, P4, P1, P5, P2
→ Second last to finish: **P5**
Gantt Chart – Round Robin (Time Quantum = 10)
| P1 | P2 | P3 | P4 | P5 | P2 | P5 | P2 |
0 9 19 23 31 41 51 52 62
RR Finishing Order: P1, P3, P4, P5, P2
→ Second last to finish: **P5**
Correct Option: D) SJF: P5 ; RR: P5

Q68 **Text Solution:**
Legal Pointer Operations in C:

- **A. pointer + number → pointer:** This is a **valid operation**. Adding an integer to a pointer moves the pointer by that many units of the size of the data type it points to. For example, if you have int *p; and you do p + 5;, p will point to the memory location 5 ints past its original location. The result is another pointer.
- **B. pointer - number → number:** This is also not a valid operation. Subtracting an integer from a pointer moves it backward in memory. The result is another pointer.
- **C. pointer + pointer → pointer:** This is not a legal operation in C. We cannot add two pointers together.
- **D. pointer - pointer → pointer:** This is not a legal operation in C. While we can subtract two pointers (see E), the result is not a pointer.
- **E. pointer - pointer → number:** This is a **valid operation**. Subtracting one pointer from another (if they point to elements within the same array or block of memory) yields the number of elements between them. The result is an integer type (specifically, ptrdiff_t).

Correct Answer: Option D) A, E Only

Q69 **Text Solution:**
Coupling from **lowest (best)** to **highest (worst)**:

1. **Stamp Coupling**: When modules share a **complex data structure** (like a record or object), but only part of it is used. This is relatively low coupling.
2. **Control Coupling**: One module controls the behavior of another by passing **control information** (e.g., flags). This increases dependency.
3. **External Coupling**: Modules share information through an **external format or protocol** (e.g., file formats, communication protocol). Stronger than control coupling.
4. **Common Coupling**: Multiple modules share **global variables**. Changes in one module can impact all others. High level of coupling.
5. **Content Coupling**: One module directly **modifies or uses internal data or code of another** module. This is the **highest and worst** form of coupling.

So, the increasing order of coupling is:
Stamp Coupling → Control Coupling → External Coupling → Common Coupling → Content Coupling
i.e. **B → C → D → A → E**
Correct Option: C) **B, C, D, A, E**

Q70 **Text Solution:**
Option A – Correct

- If a relation has only **two attributes** (say, A and B),
  - Any non-trivial functional dependency is either **A → B** or **B → A**,
  - In both cases, the **determinant is a superkey**,
    → So the relation is **always in BCNF**.

Option B – Incorrect

- If all attributes are **prime**, it guarantees **3NF**,
- But **BCNF** may still be violated if the determinant is **not a superkey**.

Option C – Incorrect

- A relation **can have only prime attributes**,
- So, not **every relation** must have a **non-prime** attribute.

Option D – Incorrect

- **BCNF decomposition** is **lossless**,
- But it does **not always preserve functional dependencies** (unlike 3NF).

Correct Answer: Option A

Q71 **Text Solution:**
A. It refers to POSIX standard (IEEE 1002.1c): This is **incorrect**. Pthreads refers to the POSIX standard, but the correct standard number is IEEE 1003.1c.
B. This standard defines API for thread creation only: This is **incorrect**. The Pthreads standard defines APIs for various thread operations, including creation, synchronization, and management.
C. This is a specification only for thread behavior and not its implementation: This statement is **correct**. Pthreads specifies how threads should behave but not how they should be implemented, allowing flexibility across different systems.
D. Operating systems like Solaris, Linux Mac OS X, except Tru64 UNIX, implement Pthreads: This statement is partially correct but incorrectly excludes Tru64 UNIX. Pthreads are implemented on many Unix-like operating systems and are also available with wrappers on Windows.
Correct Answer: Option C

Q72 **Text Solution:**
Operator Precedence in C (for given operators):

Operator	Description	Precedence Level	Associativity
>>	Bitwise right shift	High	Left to Right
>=	Relational (comparison)	Lower than >>	Left to Right
&&	Logical AND	Lower than >=	Left to Right
?:	Ternary conditional	Lower than &&	Right to Left
+=	Assignment (compound)	Lowest here	Right to Left

So, correct order (High → Low): >> → >= → && → ?: → +=

Correct Answer: Option C) C → D → A → E → B

Q73 **Text Solution:**

B. Fetch the instruction from memory: CPU reads the instruction from memory using the Program Counter (PC).

C. Decode the instruction: The fetched instruction is decoded by the instruction decoder to determine the operation and operand types.

A. Calculate the effective address: If the instruction involves memory addressing (like indirect, indexed), compute the **effective address**.

D. Fetch the operands from memory: Retrieve data (operands) needed for the instruction.

E. Execute the instruction: Perform the operation (add, move, branch, etc.).

Correct Answer: **Option C – B, C, A, D, E**

Q74 **Text Solution:**

For a fuzzy relation $\widetilde{R}$,

- The **λ-cut** $\widetilde{R}_\lambda$ is a **crisp relation** defined as:

$$\widetilde{R}_\lambda = \{(x, y) \mid \mu_{\widetilde{R}}(x, y) \geq \lambda\}$$

A:

$$(\widetilde{R} \cup \widetilde{S})_\lambda = \widetilde{R}_\lambda \cup \widetilde{S}_\lambda$$

- Union in fuzzy relations:

$$\mu_{\widetilde{R} \cup \widetilde{S}}(x, y) = \max(\mu_{\widetilde{R}}(x, y), \mu_{\widetilde{S}}(x, y))$$

- So:

$$(\widetilde{R} \cup \widetilde{S})_\lambda = \{(x, y) \mid \max(\mu_{\widetilde{R}}, \mu_{\widetilde{S}}) \geq \lambda\}$$
$$= \widetilde{R}_\lambda \cup \widetilde{S}_\lambda$$

True property

B:

$$(\widetilde{R} \cap \widetilde{S})_\lambda = \widetilde{R}_\lambda \cap \widetilde{S}_\lambda$$

- Intersection in fuzzy sets:

$$\mu_{\widetilde{R} \cap \widetilde{S}}(x, y) = \min(\mu_{\widetilde{R}}, \mu_{\widetilde{S}})$$

- Then:

$$(\widetilde{R} \cap \widetilde{S})_\lambda = \{(x, y) \mid \min(\mu_{\widetilde{R}}, \mu_{\widetilde{S}}) \geq \lambda\}$$
$$= \widetilde{R}_\lambda \cap \widetilde{S}_\lambda$$

True property

C:

$$(\widetilde{R})_\lambda \neq \widetilde{R}_\lambda \quad \text{except when } \lambda = 1$$

This **statement is misleading**.

- Both $(\widetilde{R})_\lambda$ and $\widetilde{R}_\lambda$ refer to the **same thing** — the λ-cut of $\widetilde{R}$.
- There is **no reason they would be unequal** except at λ=1.

This is a **trick statement** — it's implying some exception exists **only at λ = 1**, which is **not true**.

In fact:

$$(\widetilde{R})_\lambda = \widetilde{R}_\lambda \quad \text{for all } \lambda \in [0, 1]$$

So, this is **not a valid property**.

D: "For any $\lambda \leq \beta$, where $0 \leq \beta \leq 1$, it is true that $\widetilde{R}_\beta \subseteq \widetilde{R}_\lambda$"

This is **true**, because:

- As λ **increases**, the λ-cut **becomes smaller**, because fewer elements satisfy the higher threshold.
- So, higher λ → more strict → smaller set.
- Therefore:

$$\widetilde{R}_\beta \subseteq \widetilde{R}_\lambda \quad \text{if } \lambda \leq \beta$$

True

The incorrect (not valid) property is: ($(\widetilde{R})_\lambda \neq \widetilde{R}_\lambda$**)except when λ = 1**

So, the correct answer is **Option C.**

Q75 **Text Solution:**

Option A: `L = (a* + b* + c*)+`

→ This accepts **any combination of a, b, c** — too broad

→ **Incorrect**

Option B: L = (a + b + c)*(abc)*(a + b + c)*
→ Accepts **at least one abc** in the middle — but doesn't enforce **even number of abc**
→ **Incorrect**
Option C: L = {Set of strings starting with a, b, or c but ending with c}
→ But DFA allows ending with a or b too — not necessarily c
→ **Incorrect**
Option D: L = {Set of strings, all having even count (including 0) of substring abc}
This is the correct interpretation
– Every abc goes q0 → q1 → q2 → q3 → q0
– So DFA reaches accepting state **only if number of abc substrings is even (0, 2, 4,...)**
Correct Option: D

Q76 **Text Solution:**
Matching of Grammar Types (Chomsky Hierarchy)

List I	Grammar Type	Production Rule (List II)	Explanation
A	**Type 3 – Regular**	**IV. V → VΣ | Σ**	Regular grammars allow linear productions or ε; given rule generates strings of one or more terminals and it is right recursive.
B	**Type 2 – Context-Free**	**I. V → (V ∪ Σ)***	Only one non-terminal on LHS; RHS can be any string ⇒ context-free grammar.
C	**Type 1 – Context-Sensitive**	**II. λVβ → λ(V ∪ Σ)β**	Productions must not decrease length; LHS can have more than one symbol.
D	**Type 0 – Unrestricted**	**III. (V ∪ Σ)* → (V ∪ Σ)***	No restrictions on production; this is the most general form of grammar.

Correct Answer: C) A → IV, B → I, C → II, D → III

Q77 **Text Solution:**
A — True

- This is the **definition of conflict serializability**.
- Conflict serializable ⇔ conflict equivalent to a serial schedule.

B — True

- This is the **definition of view serializability**.
- View serializable ⇔ view equivalent to a serial schedule.

C — False

- A **serial schedule** means:
  - **All instructions of one transaction are executed first**, then the next, with **no interleaving**.
- This statement describes **non-serial** or **interleaved schedules**, so it's **incorrect**.

D — True

- **Every conflict-serializable schedule is also view-serializable**,
  - Because conflict-serializability ⊆ view-serializability.
- But the **converse is not true**:
  - Some view-serializable schedules are **not** conflict-serializable.

Correct Answer: Option C) A, B, D Only

Q78 **Text Solution:**
Statement A: "In symmetric key cryptography, the secrecy/protection of the key generating function must be of higher level than the decrypting function."
Incorrect

- In symmetric cryptography, **key secrecy** is important, but the **key generation function** itself **does not require higher protection** than the encryption/decryption logic.
- It's the **key** that must be kept secret, not necessarily the function that generates it.

Statement B: "The DES technique works by taking 64-bit chunk value and 56-bit key over a series of transformations."
Correct

- DES (Data Encryption Standard):
  - **Block size**: 64 bits

- **Key size**: 64 bits total, but **8 bits are used for parity**, so **effective key = 56 bits**

Statement C: "The Twofish symmetric block algorithm works on variable key length of up to 196 bits over a block of 128 bits."
Incorrect

- Twofish works on a **128-bit block** , but its **key size can go up to 256 bits**, not 196.
- So this statement is **partially true but factually wrong** in key size limit.

Statement D: "RC4 is the most commonly used stream cipher that encrypts & decrypts a stream of bits/bytes instead of blocks."
Correct

- RC4 is a well-known **stream cipher**, used in SSL/TLS, WEP/WPA.
- It operates on **byte streams**, not blocks.

Correct Answer: Option D) **B, D Only**

Q79 **Text Solution:**
A. "In the write-through policy, only the cache is updated"

- In **write-through** policy, **both the cache and main memory** are updated **simultaneously**.
- So, saying "only cache is updated" is **false**.

B. "In the write-back policy, both cache and main memory are updated"

- In **write-back** policy:
  - **Only cache** is updated **initially**.
  - Main memory is updated **later**, **only when the block is replaced (written back)**.
- So this statement is **false**.

C. "Cache coherence problems exist in multiprocessors with private caches because of the need to share writable data"

- In **multiprocessors**, each processor may have its **own private cache**.
- If multiple processors **write or read** shared data, it can cause **cache coherence problems** (e.g., stale copies).
- So this is **true**.

D. "Cache coherence problem can be solved by means of hardware-only scheme"

- Cache coherence can be handled by **hardware-only schemes** like:
  - **MESI protocol**, snooping, directory-based methods, etc.
- So this is **true**.

Correct Answer: Option C) C, D Only

Q80 **Text Solution:**
Kohonen SOM Overview:

- It is an **unsupervised neural network** used for **clustering** and **dimensionality reduction**.
- The **weight update rule** in SOM adjusts the weights of the **winning neuron** (Best Matching Unit - BMU) and its neighbors.

Standard Weight Update Formula in Kohonen SOM:
For each winning neuron j (and its neighbors), and for input vector $\mathbf{x} = [x_1, x_2, ..., x_n]$, the weight vector $\mathbf{w_j}$ is updated as:

$$w_{ji}^{\text{new}} = w_{ji}^{\text{old}} + \eta \cdot (x_i - w_{ji}^{\text{old}})$$

Which can be rewritten as:

$$w_{ji}^{\text{new}} = (1 - \eta) \cdot w_{ji}^{\text{old}} + \eta \cdot x_i$$

Therefore, the correct option is:

$$w_{ji}^{\text{new}} = (1 - \eta) \cdot w_{ji}^{\text{old}} + \eta \cdot x_i$$

This matches **Option A**.

Q81 **Text Solution:**
Statement A: STRIPS is a Feature-centric representation.

- This statement is **incorrect**. STRIPS is actually an **action-centric** representation. It primarily focuses on defining actions (operators) and their effects on the state of the world. The changes in state are described by how actions modify the world rather than focusing primarily on the state itself and its transitions.

Statement B: The features describing the state of the world are divided into Primitive and Derived.

- This statement is **correct**. In STRIPS, features that describe the state are categorized into primitive features (directly affected by actions) and derived features (whose values can be inferred from primitive features using definite clauses).

Statement C: The STRIPS representation of the action comprises of Precondition and Effect.

- This statement is **correct**. A STRIPS action is defined by its precondition (conditions that must be true for the action to be executable) and its effect (how the action changes the state of the world through additions and deletions). The effect is often represented as an add list (conditions that become true) and a delete list (conditions that become false).

Statement D: STRIPS can directly define conditional effects.

- This statement is **incorrect**. STRIPS cannot directly define conditional effects, where the effect of an action depends on the initial state. To model conditional effects within STRIPS, you would typically need to define separate actions for each possible condition.

Correct Answer: Option B – B, C Only

Q82 **Text Solution:**

Given Recurrence: $T(n) = 2T(n/4) + \sqrt{n}$

We are to find the tight asymptotic bound (i.e., Θ of T(n)).

The **Master Theorem** solves recurrences of the form:

$$T(n) = a \cdot T(n/b) + f(n)$$

Where:

- $a = 2$
- $b = 4$
- $f(n) = \sqrt{n} = n^{1/2}$

Apply Master Theorem

We compare to **f(n)** to $n^{\log_b a}$

Calculate:

$$\log_b a = \log_4 2 = \frac{1}{2}$$

So,

$$n^{\log_b a} = n^{1/2}$$

And,

$$f(n) = \sqrt{n} = n^{1/2}$$

Case 2 of Master Theorem applies:

If,

$$f(n) = \Theta(n^{\log_b a} \cdot \log^k n), \text{ for } k = 0$$

Then:

$$T(n) = \Theta(n^{\log_b a} \cdot \log^{k+1} n)$$
$$= \Theta(n^{1/2} \cdot \log n)$$

Correct Answer: **Option C)**

$$T(n) = \Theta(\sqrt{n} \cdot \log n)$$

Q83 **Text Solution:**

C. Characterize the structure of an optimal solution

Identify the substructure — how a solution to the problem depends on solutions to subproblems.

B. Recursively define the value of an optimal solution

Express the optimal solution value using a recurrence relation based on subproblems.

D. Compute the value of an optimal solution (bottom-up)

Solve the subproblems and store the results (memoization or tabulation).

A. Construct an optimal solution from computed information

Once all subproblem values are computed, backtrack to build the full optimal solution.

Correct Answer: **Option D) C, B, D, A**

Q84 **Text Solution:**

Non-Return to Zero (NRZ) and *Manchester Encoding* are both examples of line coding schemes used in telecommunications and data

storage to represent digital data. Line coding schemes are a subset of data encoding schemes.

- **A. Non-Return to Zero (NRZ):** This is a form of digital encoding where the binary digits (0s and 1s) are represented by specific voltage levels.
- **B. Manchester Encoding:** This is a synchronous encoding technique that combines the clock signal with the data signal into a single bitstream, where a transition in the middle of the bit period represents the data bit.
- **E. Bipolar AMI:** This is another line coding scheme that uses three voltage levels (positive, negative, and zero) to represent data, alternating the polarity for consecutive '1' bits to achieve DC balance.

Correct Answer: Option D – A, B and E Only

Q85 **Text Solution:**

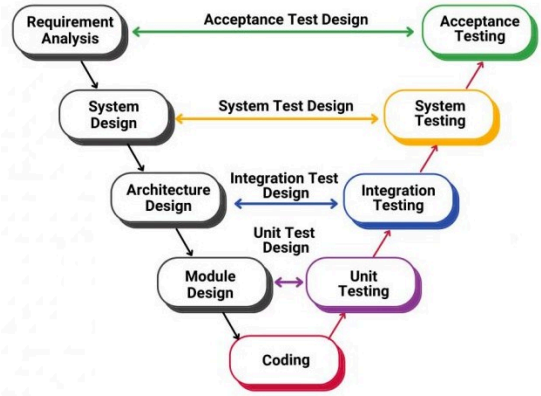
The typical order of testing in the software development lifecycle (SDLC) is as follows:

B. Unit Testing: This is the first level of testing and focuses on testing individual components or modules of the software in isolation.

A. Integration Testing: This is conducted after unit testing and verifies the interactions and data flow between integrated modules.

C. System Testing: This comes after integration testing and evaluates the behavior of the entire system as a whole against the specified requirements, including both functional and non-functional aspects.

D. Acceptance Testing: This is the final phase of testing, typically performed by end-users or clients to verify if the software meets their needs and expectations before deployment.



This order follows a logical progression, starting with testing individual components and gradually building up to testing the entire system from the user's perspective.

Correct Answer: Option B) B, A, C, D

Q86 **Text Solution:**

The correct sequence for constructing a Huffman tree is as follows:

B. Create leaf nodes: Start by creating a leaf node for each unique character in the input data, along with its frequency.

C. Build priority queue: Insert all the created leaf nodes into a priority queue (or min-heap) based on their frequencies. Nodes with lower frequencies are given higher priority.

D. Combine lowest frequency nodes: Repeatedly remove the two nodes with the lowest frequencies from the priority queue. Create a new internal node where these two nodes are its left and right children, and the new node's frequency is the sum of their frequencies.

A. Repeat until root formed: Continue repeating step D, reinserting the newly formed internal nodes into the priority queue, until only one node remains in the queue. This remaining node is the root of the Huffman tree, and the construction is complete.

Correct Answer: **Option C) B, C, D, A**

Q87 **Text Solution:**

(A) If $n \neq 1$, then $m < mn$.

Since m and n are positive integers, and $n \neq 1$, it means n must be greater than or equal to 2 ($n \geq 2$).

Multiplying both sides of the inequality $m < mn$ by 1/m (which is positive since m is a positive

integer) gives 1 < n.
This is true if n ≠ 1 and n is a positive integer.
Therefore, statement (A) is **correct**.

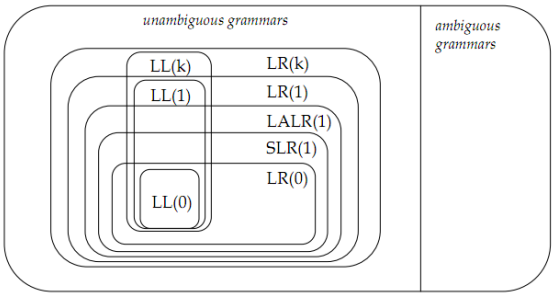
(B) If k is composite, then k = mn where 1 < m, n > k.
A composite number k can be written as a product of two positive integers m and n, where 1 < m < k and 1 < n < k.
The condition "1 < m, n > k" implies that both m and n are greater than k, which is impossible if k = mn and m, n are positive.
For example, if k = 6, then m and n could be 2 and 3. Here, 1 < 2 < 6 and 1 < 3 < 6.
So, statement (B) is **incorrect**.

(C) If mn = 1, then m = 1 and n = 1.
Since m and n are positive integers, the only way their product can be 1 is if both m and n are 1.
If m were greater than 1, then mn would be greater than n, and if n were greater than 1, then mn would be greater than m. For mn to be 1, both m and n must be 1.
Therefore, statement (C) is **correct**.

(D) If k is composite, then k = mn where 1 < m, n < k.
This is the standard definition of a composite number. A positive integer k is composite if it can be written as the product of two smaller positive integers m and n, both greater than 1 and less than k.
Therefore, statement (D) is **correct**.

Correct Answer: Option A) (A), (C), (D)

Q88 **Text Solution:**



Therefore, the correct increasing order of parser power is: **LL(0) → LR(0) → SLR → LALR(1) → LR(1)**

Correct Answer: Option C

Q89 **Text Solution:**
A. Read Status Register: The CPU first reads the **status register** to know if the device is ready.
B. Check Flag Bit: The CPU checks the **flag bit** in the status register (e.g., ready or not).
C. Read Data Register: If the flag bit indicates data is ready, the CPU reads the data from the **data register**.
D. Transfer Data to Memory: Finally, the data is moved from the CPU register to the **main memory**.
Correct Answer: Option A) A, B, C, D
NOTE: UGC NET has marked Option C as the correct answer, but upon analysis, we find **Option A** to be the most appropriate.

Q90 **Text Solution:**
D. Compare the exponents: Before performing addition/subtraction, compare exponents of the two floating-point numbers.
A. Align the mantissas: Based on the exponent comparison, shift the mantissa of the number with the smaller exponent so both have equal exponents.
B. Add or subtract the mantissas: Once aligned, perform the arithmetic operation on the mantissas.
C. Normalize the result: Adjust the result to restore the floating-point representation (i.e., bring it back to normalized form).
Correct Answer: Option A) D, A, B, C

Q91. **Text Solution:**
Leader Statements
A statement is a **leader** if:

1. **The first statement** is always a leader.
2. Any statement that is **target of a jump** is a leader.
3. Any statement that **immediately follows a jump (conditional or unconditional)** is a leader.

Analysis of the Code
Let's examine the statements line by line:

- **100** → Always a leader (Rule 1).
- **103** → if i > j goto 105 → 105 is a **target** → 105 is a **leader** (Rule 2).

Also, the statement after 103 is **104**, which is a leader (Rule 3).

- **104** → Leader (as above).
- **105** → if num > b goto 107 → 107 is a **target** → 107 is a **leader** (Rule 2).
  Also, 106 comes after a conditional jump → 106 is a **leader** (Rule 3).
- **106** → Leader (as above).
- **110** → goto 103 → 103 is a target, already marked.
  The next line **111** comes after an unconditional jump → 111 is a **leader** (Rule 3).

Final Set of Leaders:

- 100 (first statement)
- 103 (target of goto 110)
- 104 (follows conditional jump at 103)
- 105 (target of goto 103)
- 106 (follows conditional jump at 105)
- 107 (target of goto 105)
- 111 (follows unconditional goto 110)

Correct Answer: Option D) 100, 103, 104, 105, 106, 107, 111

Q92. Text Solution:

Optimized version for the given TAC is:

100: t1 = y + 2
101: limit = 10
102: num = 9
103: b = t1
104: if i > j goto 106
105: goto 110
106: if num > b goto 108
107: goto 110
108: i = i - num
109: goto 104
110: j = i - num
111: k = j + b

Optimizations Applied:

Optimization Type	**Where Applied (in given TAC)**	**Result (in Optimized TAC)**
Constant Folding	Line 107 → num = 10 - 1	Computed at compile time: num = 9
Common Subexpression Elim.	Line 100 → t1 = y + 2	Reused in Line 103: b = t1
Dead Code Elimination	Removed Line → initial = x / t1	Removed if initial not used later in the codes.
Loop Invariant Code Motion	t1 = y + 2, num = 9, b = t1	Moved outside the loop to avoid recomputation.
Control Flow Simplification	Used if i > j and if num > b	Logic rewritten to avoid complex nested branches

Correct Answer: Option C

NOTE: The original question was deleted by UGC because the correct answer was not included in the given options. To address this issue, we have modified the options for this question to ensure accuracy and alignment with the correct solution.

Q93. Text Solution:

Correct High level code for the given TAC is:

```
t1 = x/(y + 2);
limit = 10;
while (i > j && num > b) {
    num = limit - 1;
    b = y + 2;
    i = i - num;
  }
  j = i - num;
  k = j + b;
```

Correct Answer: Option D)

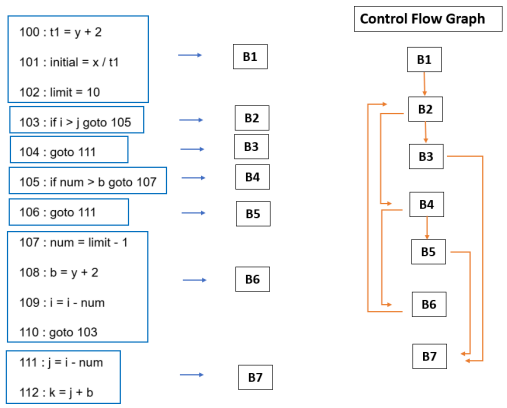
Q94. Text Solution:

A basic block is a straight-line code sequence with no branches except into the entry and out of the exit.

We'll use the leaders from a previous solution:

Leaders: 100, 103, 104, 105, 106, 107, 111

So the basic blocks are:



Dominator Definition

A **block A dominates block B** if every path from the **start node** to **block B** must go through **A**.

We now analyze dominators for:

Block 3 (B3)

- B3 only has one predecessor: **B2**
- Path: B1 → B2 → B3
- So, **B1 and B2 must be executed** to reach B3
- **Does B3 dominate anything?**

→ B3 only leads to B7

But B7 can also be reached via B5 (which is from B4)

So **B3 does NOT dominate B7**

Block 3 dominates only itself

Block 5 (B5)

- Predecessor: B4
- B5 → B7
- B7 can also be reached via B3 (from B2), so B5 is **not a dominator of B7**

Block 5 dominates only itself

Final Answer:

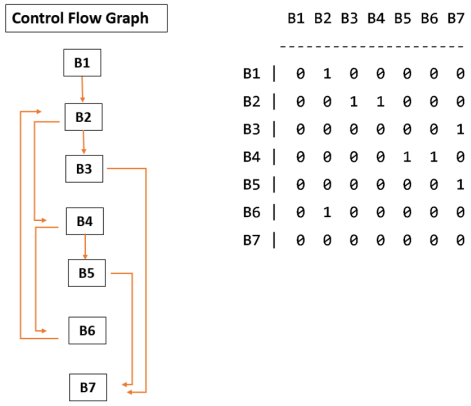
- **Block 3 dominates:** Only Block 3
- **Block 5 dominates:** Only Block 5

Correct Answer: Option A

Q95. Text Solution:

Construct the Flow Graph Matrix (Adjacency Matrix)

Matrix M[i][j] = 1 if there's a direct edge from block **i** to block **j**, else 0.

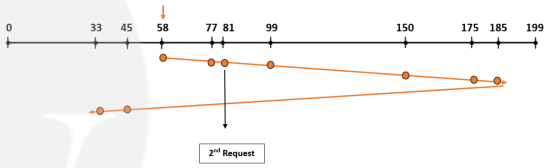


Correct Answer: Option A

Q96. Text Solution:

C-LOOK Scheduling

- C-LOOK (Circular LOOK) moves **only in one direction (right)** until the highest request.
- Then it **jumps back** to the lowest request and continues.
- Head **starts at 58** and moves **only to higher cylinder numbers** first.



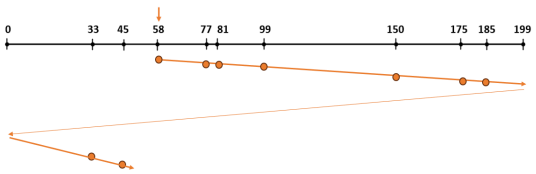
Second request served is : 81

Correct Answer: A) 81

Q97. Text Solution:

C-SCAN Algorithm:

- The head **moves only in one direction** (right in this case).
- It **services all requests in that direction** until it reaches the **end of the disk (199)**.
- Then it **jumps back to the beginning (0)** without servicing any request during this jump.
- It continues servicing requests again in the **same direction**.



Total Head Movement: (199 – 58) + (199 – 0) + (45 - 0) = 385

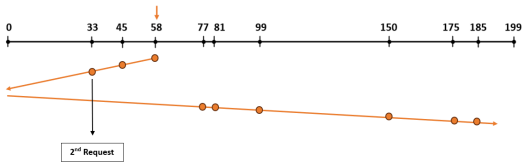
Correct Answer: D) 385 Cylinders

Q98. Text Solution:

SCAN (Left) Algorithm

Also known as **Elevator algorithm**:

- Head moves **in a given direction** (left here) and **serves all requests** in that direction.
- It **goes to the end (or last request in that direction)**, and then **reverses direction**.



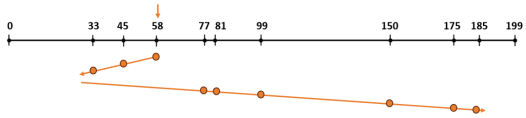
Second request served is : 33

Q99. Text Solution:

In SSTF, the head moves to the **closest request** from its current position. So it always selects the request that will take the **least movement** or seek time.

According to given example (starting from 58), the algorithm would work like this:

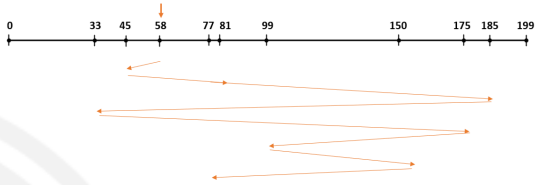
- From 58, the closest is **45**
- From 45, the closest is **33**
- From 33, the closest is **77**
- From 77, the closest is **81**
- Then 99, then 150, then 175, then 185



Total Head Movement: (58 – 33) + (185 – 33) = **177 cylinders**

Q100. Text Solution:

In FCFS, the disk head services the requests **in the exact order they arrive**, just like a queue.



Total Head Movement: (58 – 45) + (185 – 45) + (185 – 33) + (175 – 33) + (175 -99) + (150 – 99) + (150 – 77)

= 13 + 140 + 152 + 142 + 76 + 51 + 73 = = **647 cylinders**