GATE 2025 1st Feb 25 S1

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Subject	CS 1 Computer Science and Information Technology

Section : **General Aptitude**

Q.1 According to the map shown in the figure, which one of the following statements is correct?

Note: The figure shown is representative.
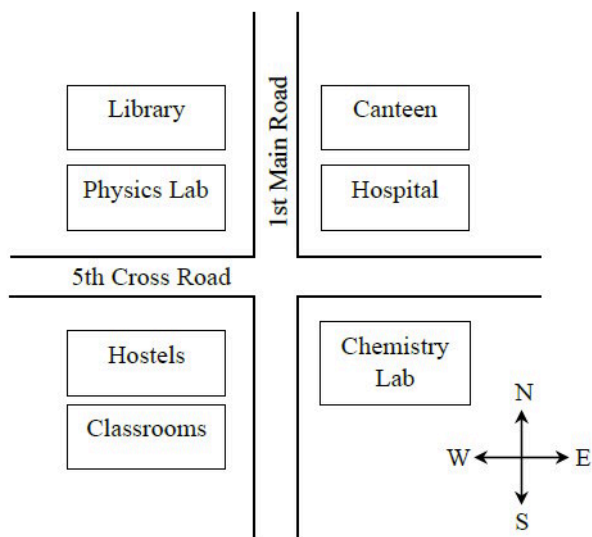
Options

A. The library is located to the northwest of the canteen.

B. The classrooms and canteen are next to each other.

C. The chemistry lab is to the southeast of physics lab.

D. The hospital is located to the east of the chemistry lab.

Question Type : **MCQ**
Question ID : **1422765926**
Status : **Answered**
Chosen Option : **C**

Q.2

Consider the relationships among P, Q, R, S, and T:

- P is the brother of Q.
- S is the daughter of Q.
- T is the sister of S.
- R is the mother of Q.

The following statements are made based on the relationships given above.

(1) R is the grandmother of S.

(2) P is the uncle of S and T.

(3) R has only one son.

(4) Q has only one daughter.

Which one of the following options is correct?

Options

A. Only (3) is true.

B. Only (4) is true.

C. Both (1) and (3) are true.

D. Both (1) and (2) are true.

Question Type :	**MCQ**
Question ID :	**1422765925**
Status :	**Answered**
Chosen Option :	**D**

Q.3

A fair six-faced dice, with the faces labelled '1', '2', '3', '4', '5', and '6', is rolled thrice. What is the probability of rolling '6' exactly once?

Options

A. $\dfrac{75}{216}$

B. $\dfrac{1}{18}$

C. $\dfrac{1}{6}$

D. $\dfrac{25}{216}$

Question Type :	**MCQ**
Question ID :	**1422765929**
Status :	**Answered**
Chosen Option :	**A**

Q.4 In the diagram, the lines QR and ST are parallel to each other. The shortest distance between these two lines is half the shortest distance between the point P and line QR. What is the ratio of the area of the triangle PST to the area of the trapezium SQRT?

Note: The figure shown is representative.
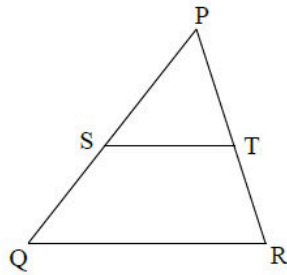
Options

A. $\dfrac{1}{4}$

B. $\dfrac{1}{3}$

C. $\dfrac{1}{2}$

D. $\dfrac{2}{5}$

Question Type :	**MCQ**
Question ID :	**1422765928**
Status :	**Not Attempted and Marked For Review**
Chosen Option :	**--**

Q.5 The CEO's decision to downsize the workforce was considered <u>myopic</u> because it sacrificed long-term stability to accommodate short-term gains.

Select the most appropriate option that can replace the word "myopic" without changing the meaning of the sentence.

Options

A. shortsighted

B. innovative

C. progressive

D. visionary

|	
Question Type :	**MCQ**
Question ID :	**1422765923**
Status :	**Answered**
Chosen Option :	**A**

Q.6 A square paper, shown in figure (I), is folded along the dotted lines as shown in the figures (II) and (III). Then a few cuts are made as shown in figure (IV). Which one of the following patterns will be obtained when the paper is unfolded?

Note: The figures shown are representative.

(I)   (II)   (III)   (IV)

Options

A.

B.

C.

D.
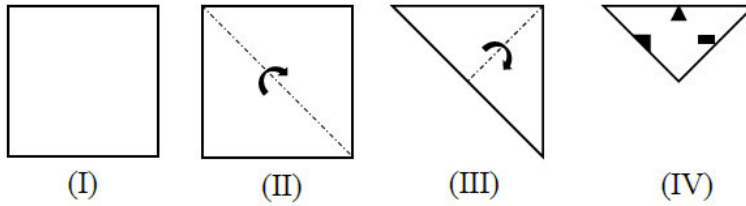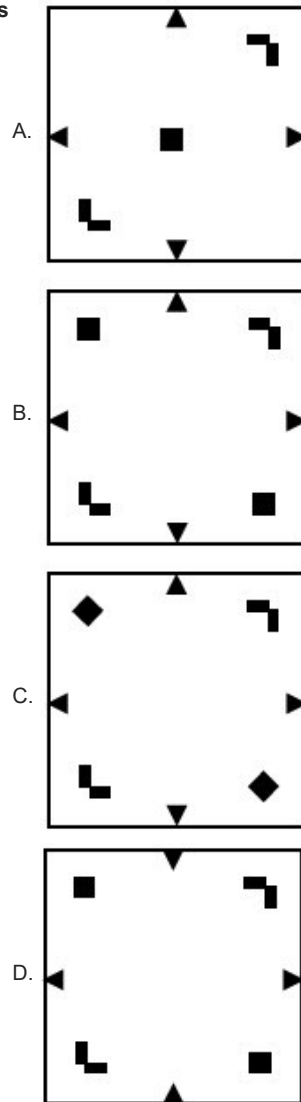
Question Type : **MCQ**

Question ID : **1422765930**

Status : **Not Answered**

Chosen Option : **--**

Q.7

The average marks obtained by a class in an examination were calculated as 30.8. However, while checking the marks entered, the teacher found that the marks of one student were entered incorrectly as 24 instead of 42. After correcting the marks, the average becomes 31.4. How many students does the class have?

Options

A. 28

B. 32

C. 25

D. 30

Question Type : **MCQ**
Question ID : **1422765924**
Status : **Answered**
Chosen Option : **D**

Q.8

A shop has 4 distinct flavors of ice-cream. One can purchase any number of scoops of any flavor. **The order in which the scoops are purchased is inconsequential.** If one wants to purchase 3 scoops of ice-cream, in how many ways can one make that purchase?

Options

A. 4

B. 48

C. 20

D. 24

Question Type : **MCQ**
Question ID : **1422765931**
Status : **Marked For Review**
Chosen Option : **B**

Q.9

Ravi had _____ younger brother who taught at _____ university. He was widely regarded as _____ honorable man.

Select the option with the correct sequence of articles to fill in the blanks.

Options

A. an; an; a

B. the; an; a

C. a; a; an

D. a; an; a

Question Type : **MCQ**
Question ID : **1422765922**
Status : **Answered**
Chosen Option : **C**

Q.10

"I put the brown paper in my pocket along with the chalks, and possibly other things. I suppose every one must have reflected how primeval and how poetical are the things that one carries in one's pocket: the pocket-knife, for instance the type of all human tools, the infant of the sword. Once I planned to write a book of poems entirely about the things in my pocket. But I found it would be too long: and the age of the great epics is past."

(From G.K. Chesterton's "A Piece of Chalk")

Based only on the information provided in the above passage, which one of the following statements is true?

Options A. The author of the passage carries a mirror in his pocket to reflect upon things.

B. Epics are described as too inconvenient to write.

C. The pocket-knife is described as the infant of the sword.

D. The author of the passage had decided to write a poem on epics.

Question Type : **MCQ**
Question ID : **1422765927**
Status : **Answered**
Chosen Option : **C**

Section : **CS 1 Computer Science and Information Technology**

Q.1 $g(.)$ is a function from A to B, $f(.)$ is a function from B to C, and their composition defined as $f(g(.))$ is a mapping from A to C.

If $f(.)$ and $f(g(.))$ are onto (surjective) functions, which ONE of the following is TRUE about the function $g(.)$?

Options
A. $g(.)$ is not required to be a one-to-one or onto function.

B. $g(.)$ must be a one-to-one (injective) function.

C. $g(.)$ must be an onto (surjective) function.

D. $g(.)$ must be a bijective function, that is, both one-to-one and onto.

Question Type : **MCQ**
Question ID : **1422765938**
Status : **Not Answered**
Chosen Option : **--**

Q.2 Consider the given function $f(x)$.

$$f(x) = \begin{cases} ax + b & \text{for } x < 1 \\ x^3 + x^2 + 1 & \text{for } x \geq 1 \end{cases}$$

If the function is differentiable everywhere, the value of b must be _____. (rounded off to one decimal place)

Given Answer : --

Question Type : **NAT**
Question ID : **1422765952**
Status : **Not Answered**

Q.3 Suppose a program is running on a non-pipelined single processor computer system. The computer is connected to an external device that can interrupt the processor asynchronously. The processor needs to execute the interrupt service routine (ISR) to serve this interrupt. The following steps (not necessarily in order) are taken by the processor when the interrupt arrives:

    (i)   The processor saves the content of the program counter.
    (ii)   The program counter is loaded with the start address of the ISR.
    (iii) The processor finishes the present instruction.

Which ONE of the following is the CORRECT sequence of steps?

Options
A. (iii), (i), (ii)

B. (i), (ii), (iii)

C. (iii), (ii), (i)

D. (i), (iii), (ii)

Question Type : **MCQ**
Question ID : **1422765932**
Status : **Marked For Review**
Chosen Option : **C**

Q.4 A partial data path of a processor is given in the figure, where RA, RB, and RZ are 32-bit registers. Which option(s) is/are CORRECT related to arithmetic operations using the data path as shown?
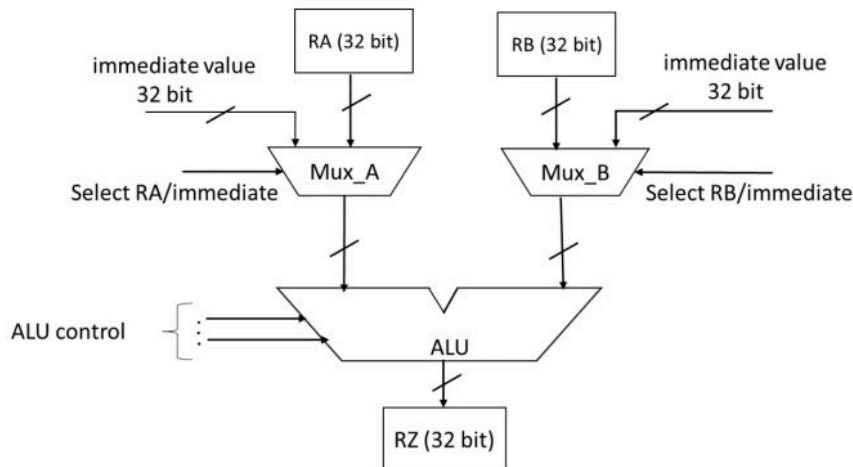
Options A. The data path can only implement arithmetic operations involving one register and one immediate value.

B. The data path can implement arithmetic operations involving two registers.

C. The data path can implement arithmetic operations involving two immediate values.

D. The data path can implement arithmetic operations involving one register and one immediate value.

> Question Type : **MSQ**
> Question ID : **1422765948**
> Status : **Marked For Review**
> Chosen Option : **B,C**

Q.5 Which ONE of the following techniques used in compiler code optimization uses live variable analysis?

Options A. Constant folding

B. Strength reduction

C. Register assignment to variables

D. Run-time function call management

> Question Type : **MCQ**
> Question ID : **1422765934**
> Status : **Not Answered**
> Chosen Option : **--**

Q.6 The height of any rooted tree is defined as the maximum number of edges in the path from the root node to any leaf node.

Suppose a Min-Heap T stores 32 keys. The height of T is _____.
(Answer in integer)

Give **5**
n
Ans
wer :

Question Type : **NAT**
Question ID : **1422765956**
Status : **Answered**

Q.7 The pseudocode of a function **fun()** is given below:

```
fun(int A[0,…,n-1]){
    for i=0 to n-2
        for j=0 to n-i-2
            if (A[j]>A[j+1])
                then swap A[j] and A[j+1]

}
```

Let $A[0, ...,29]$ be an array storing 30 distinct integers in descending order. The number of swap operations that will be performed, if the function **fun()** is called with $A[0, ...,29]$ as argument, is _____. (Answer in integer)

Give **406**
n
Ans
wer :

Question Type : **NAT**
Question ID : **1422765954**
Status : **Answered**

Q.8 Consider the given system of linear equations for variables x and y, where k is a real-valued constant. Which of the following option(s) is/are CORRECT?

$$x + ky = 1$$
$$kx + y = -1$$

Options A.
There exist an infinite number of values of k for which the system of equations has no solution.

B.
There is exactly one value of k for which the above system of equations has no solution.

C.
There exists exactly one value of k for which the system of equations has exactly one solution.

D.
There exists exactly one value of k for which the system of equations has an infinite number of solutions.

Question Type : **MSQ**
Question ID : **1422765944**
Status : **Marked For Review**
Chosen Option : **A,D**

Q.9 Which ONE of the following statements is **FALSE** regarding the symbol table?

Options A.

Symbol table is responsible for keeping track of the scope of variables.

B. Symbol table is not required after the parsing phase.

C.

Symbol table can be implemented using a binary search tree.

D. Symbol table is created during the lexical analysis phase.

Question Type : **MCQ**

Question ID : **1422765933**

Status : **Marked For Review**

Chosen Option : **D**

Q.10 Identify the ONE CORRECT matching between the OSI layers and their corresponding functionalities as shown.

OSI Layers	Functionalities
(a) Network layer	(I) Packet routing
(b) Transport layer	(II) Framing and error handling
(c) Datalink layer	(III) Host to host communication

Options A. (a)-(II), (b)-(I), (c)-(III)

B. (a)-(I), (b)-(II), (c)-(III)

C. (a)-(III), (b)-(II), (c)-(I)

D. (a)-(I), (b)-(III), (c)-(II)

Question Type : **MCQ**

Question ID : **1422765937**

Status : **Answered**

Chosen Option : **D**

Q.11 A regular language L is accepted by a non-deterministic finite automaton (NFA) with n states. Which of the following statement(s) is/are FALSE?

Options A. There exists a DFA with $\leq 2^n$ states that accepts L.

B. L may have an accepting NFA with $< n$ states.

C. L may have an accepting DFA with $< n$ states.

D. Every DFA that accepts L has $> 2^n$ states.

Question Type : **MSQ**

Question ID : **1422765949**

Status : **Answered**

Chosen Option : **A,B**

Q.12 Consider the following context-free grammar G, where S, A, and B are the variables (non-terminals), a and b are the terminal symbols, S is the start variable, and the rules of G are described as:

$$S \rightarrow aaB \mid Abb$$

$$A \rightarrow a \mid aA$$

$$B \rightarrow b \mid bB$$

Which ONE of the languages $L(G)$ is accepted by G?

Options A. $L(G) = \{a^2 b^n \mid n \geq 1\} \cup \{a^n b^2 \mid n \geq 1\}$

    B. $L(G) = \{a^n b^n \mid n \geq 1\}$

    C. $L(G) = \{a^{2n} b^{2n} \mid n \geq 1\}$

    D. $L(G) = \{a^n b^{2n} \mid n \geq 1\} \cup \{a^{2n} b^n \mid n \geq 1\}$

Question Type : **MCQ**
Question ID : **1422765940**
Status : **Marked For Review**
Chosen Option : **A**

Q.13 A schedule of three database transactions T_1, T_2, and T_3 is shown. $R_i(A)$ and $W_i(A)$ denote read and write of data item A by transaction $T_i, i = 1,2,3$. The transaction T_1 aborts at the end. Which other transaction(s) will be required to be rolled back?

$$R_1(X) \ W_1(Y) \ R_2(X) \ R_2(Y) \ R_3(Y) \ ABORT(T_1)$$

Options A. Both T_2 and T_3

    B. Neither T_2 nor T_3

    C. Only T_3

    D. Only T_2

Question Type : **MCQ**
Question ID : **1422765936**
Status : **Marked For Review**
Chosen Option : **A**

Q.14 The number -6 can be represented as 1010 in 4-bit 2's complement representation. Which of the following is/are CORRECT 2's complement representation(s) of -6?

Options A. 1111 1010 in 8-bits

    B. 1111 1111 1111 1010 in 16-bits

    C. 1000 0000 0000 1010 in 16-bits

    D. 1000 1010 in 8-bits

Question Type : **MSQ**
Question ID : **1422765946**
Status : **Answered**
Chosen Option : **A,B**

Q.15

```c
#include <stdio.h>
void foo(int *p, int x){
    *p=x;
}
int main(){
    int *z;
    int a = 20, b = 25;
    z = &a;
    foo(z,b);
    printf("%d",a);
    return 0;
}
```

The output of the given C program is _____. (Answer in integer)

Give n
Ans
wer : **25**

Question Type : **NAT**	
Question ID : **1422765955**	
Status : **Answered**	

Q.16 Consider the following recurrence relation:

$$T(n) = 2T(n - 1) + n2^n \text{ for } n > 0, \quad T(0) = 1.$$

Which ONE of the following options is CORRECT?

Options A. $T(n) = \Theta(n2^n)$

B. $T(n) = \Theta((\log n)^2 \, 2^n)$

C. $T(n) = \Theta(n^2 2^n)$

D. $T(n) = \Theta(4^n)$

Question Type : **MCQ**	
Question ID : **1422765941**	
Status : **Marked For Review**	
Chosen Option : **C**	

Q.17 A box contains 5 coins: 4 regular coins and 1 fake coin. When a regular coin is tossed, the probability $P(head) = 0.5$ and for a fake coin, $P(head) = 1$. You pick a coin at random and toss it twice, and get two heads. The probability that the coin you have chosen is the fake coin is _____. (rounded off to two decimal places)

Give n
Ans
wer : **0.8**

Question Type : **NAT**	
Question ID : **1422765953**	
Status : **Answered**	

Q.18 Consider the following B^+ tree with 5 nodes, in which a node can store at most 3 key values
The value 23 is now inserted in the B^+ tree. Which of the following options(s) is/are
CORRECT?
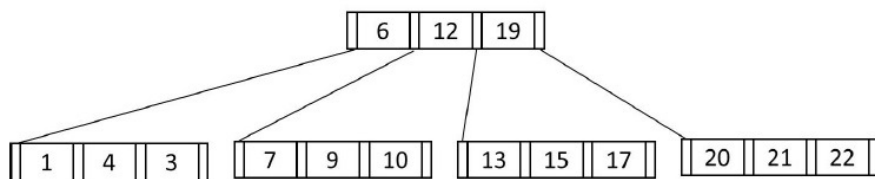
Options A. None of the nodes will split.

  B. The height of the tree will increase.

  C. The total number of nodes will remain same.

  D. At least one node will split and redistribute.

Question Type : **MSQ**
Question ID : **1422765942**
Status : **Marked For Review**
Chosen Option : **B,D**

Q.19 Suppose in a multiprogramming environment, the following C program segment is
executed. A process goes into I/O queue whenever an I/O related operation is
performed. Assume that there will always be a context switch whenever a process
requests for an I/O, and also whenever the process returns from an I/O. The number
of times the process will enter the ready queue during its lifetime (not counting the
time the process enters the ready queue when it is run initially) is _____. (Answer
in integer)

```
int main()
{
    int x=0,i=0;
    scanf("%d",&x);
    for(i=0; i<20; i++)
    {
        x = x+20;
        printf("%d\n",x);
    }
    return 0;
}
```

Give **21**
n
Ans
wer :

Question Type : **NAT**
Question ID : **1422765950**
Status : **Marked For Review**

Q.20 Which of the following statement(s) is/are TRUE for any binary search tree (BST) having n distinct integers?

Options

A. Finding an element takes $O(\log_2 n)$ time in the worst case.

B.
An inorder traversal will always produce a sorted sequence of elements.

C.
The maximum length of a path from the root node to any other node is $(n - 1)$.

D. Every BST is also a Min-Heap.

Question Type : **MSQ**
Question ID : **1422765947**
Status : **Marked For Review**
Chosen Option : **A,B**

Q.21 Let G be any undirected graph with positive edge weights, and T be a minimum spanning tree of G. For any two vertices, u and v, let $d_1(u, v)$ and $d_2(u, v)$ be the shortest distances between u and v in G and T, respectively. Which ONE of the options is CORRECT for all possible G, T, u and v?

Options

A. $d_1(u, v) \neq d_2(u, v)$

B. $d_1(u, v) \leq d_2(u, v)$

C. $d_1(u, v) = d_2(u, v)$

D. $d_1(u, v) \geq d_2(u, v)$

Question Type : **MCQ**
Question ID : **1422765939**
Status : **Marked For Review**
Chosen Option : **D**

Q.22 Let X be a 3-variable Boolean function that produces output as '1' when at least two of the input variables are '1'. Which of the following statement(s) is/are CORRECT, where a, b, c, d, e are Boolean variables?

Options

A. $X(a, b, X(a, c, d)) = (X(a, b, a) \text{ AND } X(c, d, c))$

B. $X(a, b, c) = X(a, X(a, b, c), X(a, c, c))$

C. $X(a, b, X(a, b, c)) = X(a, b, c)$

D. $X(a, b, X(c, d, e)) = X(X(a, b, c), d, e)$

Question Type : **MSQ**
Question ID : **1422765945**
Status : **Marked For Review**
Chosen Option : **A,D**

Q.23 Let S be the set of all ternary strings defined over the alphabet $\{a, b, c\}$. Consider all strings in S that contain at least one occurrence of two consecutive symbols, that is, "aa", "bb" or "cc". The number of such strings of length 5 that are possible is _____. (Answer in integer)

Given Answer : **162**

Question Type : **NAT**
Question ID : **1422765951**
Status : **Marked For Review**

Q.24 Consider the 3-way handshaking protocol for TCP connection establishment. Let the three packets exchanged during the connection establishment be denoted as P1, P2, and P3, in order. Which of the following option(s) is/are TRUE with respect to TCP header flags that are set in the packets?

Options A. $P3: SYN = 1, ACK = 1$

B. $P1: SYN = 1$

C. $P2: SYN = 0, ACK = 1$

D. $P2: SYN = 1, ACK = 1$

Question Type : **MSQ**
Question ID : **1422765943**
Status : **Marked For Review**
Chosen Option : **A,B,C**

Q.25 Consider a demand paging memory management system with 32-bit logical address, 20-bit physical address, and page size of 2048 bytes. Assuming that the memory is byte addressable, what is the maximum number of entries in the page table?

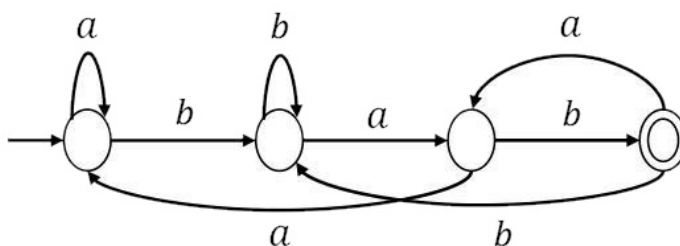Options A. 2^{20}

B. 2^{24}

C. 2^{22}

D. 2^{21}

Question Type : **MCQ**
Question ID : **1422765935**
Status : **Not Answered**
Chosen Option : **--**

Q.26 Consider the following deterministic finite automaton (DFA) defined over the alphabet, $\Sigma = \{a, b\}$. Identify which of the following language(s) is/are accepted by the given DFA.

Options A. The set of all strings not containing the pattern aba.

B. The set of all strings containing the pattern bab.

C. The set of all strings containing an even number of b's.

D. The set of all strings ending with the pattern bab.

Question Type :	**MSQ**
Question ID :	**1422765971**
Status :	**Answered**
Chosen Option :	**B,D**

Q.27 Suppose a 5-bit message is transmitted from a source to a destination through a noisy channel. The probability that a bit of the message gets flipped during transmission is 0.01. Flipping of each bit is independent of one another. The probability that the message is delivered error-free to the destination is _____ . (rounded off to three decimal places)

Given Answer : **0.950**

Question Type :	**NAT**
Question ID :	**1422765977**
Status :	**Answered**

Q.28 Consider the following two languages over the alphabet $\{a, b\}$:

$$L_1 = \{\, \alpha\beta\alpha \mid \alpha \in \{a, b\}^+ \text{ AND } \beta \in \{a, b\}^+ \,\}$$

$$L_2 = \{\, \alpha\beta\alpha \mid \alpha \in \{a\}^+ \text{ AND } \beta \in \{a, b\}^+ \,\}$$

Which ONE of the following statements is CORRECT?

Options A. Neither L_1 nor L_2 is a regular language.

B. L_1 is a regular language but L_2 is not a regular language.

C. L_1 is not a regular language but L_2 is a regular language.

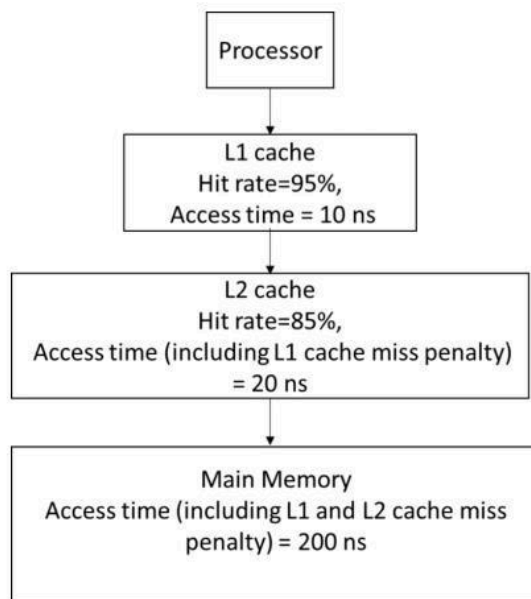D. Both L_1 and L_2 are regular languages.

Question Type :	**MCQ**
Question ID :	**1422765965**
Status :	**Not Answered**
Chosen Option :	**--**

Q.29 A computer has a memory hierarchy consisting of two-level cache (L1 and L2) and a main memory. If the processor needs to access data from memory, it first looks into L1 cache. If the data is not found in L1 cache, it goes to L2 cache. If it fails to get the data from L2 cache, it goes to main memory, where the data is definitely available. *Hit rates* and *access times* of various memory units are shown in the figure. The *average memory access time* in nanoseconds (*ns*) is _____. (rounded off to two decimal places)

```
              ┌──────────────┐
              │  Processor   │
              └──────┬───────┘
                     │
          ┌──────────▼──────────┐
          │     L1 cache        │
          │  Hit rate=95%,      │
          │ Access time = 10 ns │
          └──────────┬──────────┘
                     │
     ┌───────────────▼──────────────────┐
     │            L2 cache               │
     │         Hit rate=85%,             │
     │ Access time (including L1 cache   │
     │        miss penalty)              │
     │            = 20 ns                │
     └───────────────┬──────────────────┘
                     │
     ┌───────────────▼──────────────────┐
     │          Main Memory              │
     │ Access time (including L1 and L2  │
     │   cache miss penalty) = 200 ns    │
     │                                   │
     └───────────────────────────────────┘
```

Given Answer : **11.85**

Question Type : **NAT**
Question ID : **1422765974**
Status : **Marked For Review**

Q.30 Let **LIST** be a datatype for an implementation of linked list defined as follows:

```
typedef struct list {
    int data;
    struct list *next;
} LIST;
```

Suppose a program has created two linked lists, L1 and L2, whose contents are given in the figure below (code for creating L1 and L2 is not provided here). L1 contains 9 nodes, and L2 contains 7 nodes.

Consider the following C program segment that modifies the list L1. The number of nodes that will be there in L1 after the execution of the code segment is _____ . (Answer in integer)
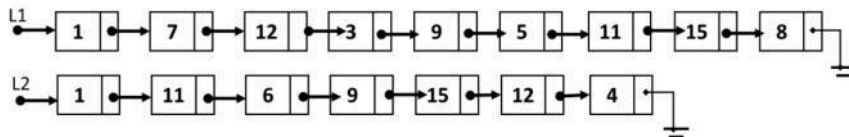

```
int find (int query, LIST *list) {
    while (list != NULL){
        if(list->data == query) return 1;
        list = list->next;
    }
    return 0;
}
int main () {
     … … …
    ptr1=L1; ptr2=L2;
    while (ptr1->next != NULL){
        query = ptr1->next->data;
        if (find (query, L2))
            ptr1->next = ptr1->next->next;
        else ptr1 = ptr1->next;
    }
     … … …
    return 0;
}
```

Given Answer : **4**

Question Type : **NAT**
Question ID : **1422765983**
Status : **Answered**

Q.31 A packet with the destination IP address 145.36.109.70 arrives at a router whose routing table is shown. Which interface will the packet be forwarded to?

Subnet Address	Subnet Mask (in CIDR notation)	Interface
145.36.0.0	/16	E1
145.36.128.0	/17	E2
145.36.64.0	/18	E3
145.36.255.0	/24	E4
Default	--	E5

Options A. E3

B. E5

C. E1

D. E2

Question Type : **MCQ**

Question ID : **1422765961**

Status : **Marked For Review**

Chosen Option : **C**

Q.32 Consider a memory system with 1M bytes of main memory and 16K bytes of cache memory. Assume that the processor generates 20-bit memory address, and the cache block size is 16 bytes. If the cache uses direct mapping, how many bits will be required to store all the *tag* values? [Assume memory is byte addressable, $1K=2^{10}$, $1M=2^{20}$.]

Options A. 8×2^{10}

B. 6×2^{10}

C. 2^{14}

D. 2^{12}

Question Type : **MCQ**

Question ID : **1422765957**

Status : **Not Answered**

Chosen Option : **--**

Q.33 Let A be a 2×2 matrix as given.

$$A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

What are the eigenvalues of the matrix A^{13} ?

Options A. $1, -1$

   B. $4\sqrt{2}, -4\sqrt{2}$

   C. $64\sqrt{2}, -64\sqrt{2}$

   D. $2\sqrt{2}, -2\sqrt{2}$

Question Type : **MCQ**
Question ID : **1422765962**
Status : **Not Answered**
Chosen Option : **--**

Q.34 Consider the following two languages over the alphabet $\{a, b, c\}$, where m and n are natural numbers.

$$L_1 = \{a^m b^m c^{m+n} \mid m, n \geq 1\}$$

$$L_2 = \{a^m b^n c^{m+n} \mid m, n \geq 1\}$$

Which ONE of the following statements is CORRECT?

Options A. Both L_1 and L_2 are context-free languages.

B.
L_1 is not a context-free language but L_2 is a context-free language.

C.
L_1 is a context-free language but L_2 is not a context-free language.

D. Neither L_1 nor L_2 are context-free languages.

Question Type : **MCQ**
Question ID : **1422765966**
Status : **Not Answered**
Chosen Option : **--**

Q.35 In optimal page replacement algorithm, information about all future page references is available to the operating system (OS). A modification of the optimal page replacement algorithm is as follows:

The OS correctly predicts only up to next 4 page references (including the current page) at the time of allocating a frame to a page.

A process accesses the pages in the following order of page numbers:

$$1, 3, 2, 4, 2, 3, 1, 2, 4, 3, 1, 4.$$

If the system has three memory frames that are initially empty, the number of page faults that will occur during execution of the process is _____ . (Answer in integer)

Give -- n Answer :

Question Type : **NAT**
Question ID : **1422765975**
Status : **Not Answered**

Q.36 Refer to the given 3-address code sequence. This code sequence is split into basic blocks. The number of basic blocks is _____. (Answer in integer)

```
1001: i = 1
1002: j = 1
1003: t1 = 10*i
1004: t2 = t1+j
1005: t3 = 8*t2
1006: t4 = t3-88
1007: a[t4] = 0.0
1008: j = j+1
1009: if j <= 10 goto 1003
1010: i = i+1
1011: if i <= 10 goto 1002
1012: i = 1
1013: t5 = i-1
1014: t6 = 88*t5
1015: a[t6] = 1.0
1016: i = i+1
1017: if i <= 10 goto 1013
```

Give -- n Answer :

Question Type : **NAT**
Question ID : **1422765973**
Status : **Not Answered**

Q.37 Consider a probability distribution given by the density function $P(x)$.

$$P(x) = \begin{cases} Cx^2, & \text{for } 1 \leq x \leq 4 \\ 0, & \text{for } x < 1 \text{ or } x > 4 \end{cases}$$

The probability that x lies between 2 and 3, i.e., $P(2 \leq x \leq 3)$ is _____.
(rounded off to three decimal places)

Given Answer : **0.235**

Question Type : **NAT**
Question ID : **1422765979**
Status : **Answered**

Q.38 Consider the following C program:

```c
#include <stdio.h>
int gate (int n) {
    int d, t, newnum, turn;
    newnum = turn = 0; t=1;
    while (n>=t) t *= 10;
    t /=10;
    while (t>0) {
        d = n/t;
        n = n%t;
        t /= 10;
        if (turn) newnum = 10*newnum + d;
        turn = (turn + 1) %2;
    }
    return newnum;
}
int main () {
    printf ("%d", gate(14362));
    return 0;

}
```

The value printed by the given C program is _____ . (Answer in integer)

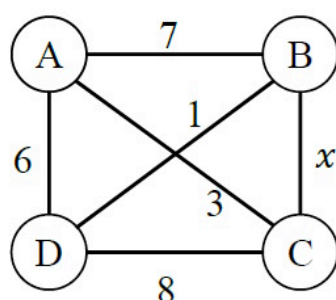Given Answer : **46**

Question Type : **NAT**
Question ID : **1422765984**
Status : **Answered**

Q.39 The maximum value of x such that the edge between the nodes B and C is included in every minimum spanning tree of the given graph is _____ . (answer in integer)

Give **8**
n
Ans
wer :

Question Type : **NAT**
Question ID : **1422765985**
Status : **Marked For Review**

Q.40 Consider two relations describing *teams* and *players* in a sports league:

- *teams*(*tid, tname*): *tid, tname* are team-id and team-name, respectively
- *players*(*pid, pname, tid*): *pid, pname,* and *tid* denote player-id, player-name and the team-id of the player, respectively

Which ONE of the following tuple relational calculus queries returns the name of the players who play for the team having *tname* as $'MI'$?

Options A.
$\{ p.pname \mid p \in teams \wedge \exists t \ (t \in players \wedge t.tname = 'MI')\}$

B.
$\{ p.pname \mid p \in teams \wedge \exists t \ (t \in players \wedge p.tid = t.tid \wedge t.tname = 'MI')\}$

C.
$\{ p.pname \mid p \in players \wedge \exists t \ (t \in teams \wedge p.tid = t.tid \wedge t.tname = 'MI')\}$

D.
$\{ p.pname \mid p \in players \wedge \exists t \ (t \in teams \wedge t.tname = 'MI')\}$

Question Type : **MCQ**
Question ID : **1422765960**
Status : **Answered**
Chosen Option : **C**

Q.41 In a double hashing scheme, $h_1(k) = k \bmod 11$ and $h_2(k) = 1 + (k \bmod 7)$ are the auxiliary hash functions. The size m of the hash table is 11. The hash function for the i-th probe in the open address table is $[h_1(k) + i \, h_2(k)] \bmod m$. The following keys are inserted in the given order: $63, 50, 25, 79, 67, 24$.

The slot at which key 24 gets stored is _____. (Answer in integer)

Give **10**
n
Ans
wer :

Question Type : **NAT**
Question ID : **1422765986**
Status : **Answered**

Q.42 A computer has two processors, M_1 and M_2. Four processes P_1, P_2, P_3, P_4 with CPU bursts of 20, 16, 25, and 10 milliseconds, respectively, arrive at the same time and these are the only processes in the system. The scheduler uses non-preemptive priority scheduling, with priorities decided as follows:

- M_1 uses priority of execution for the processes as, $P_1 > P_3 > P_2 > P_4$, i.e., P_1 and P_4 have highest and lowest priorities, respectively.
- M_2 uses priority of execution for the processes as, $P_2 > P_3 > P_4 > P_1$, i.e., P_2 and P_1 have highest and lowest priorities, respectively.

A process P_i is scheduled to a processor M_k, if the processor is free and no other process P_j is waiting with higher priority. At any given point of time, a process can be allocated to any one of the free processors without violating the execution priority rules. Ignore the context switch time. What will be the average waiting time of the processes in milliseconds?

Options
A. 6.50

B. 9.00

C. 7.50

D. 8.75

Question Type : **MCQ**
Question ID : **1422765959**
Status : **Not Answered**
Chosen Option : **--**

Q.43 Consider a relational schema $team(name, city, owner)$, with functional dependencies $\{name \rightarrow city, \ name \rightarrow owner\}$.

The relation $team$ is decomposed into two relations, $t1(name, city)$ and $t2(name, owner)$. Which of the following statement(s) is/are TRUE?

Options
A. The relations $t1$ and $t2$ are in BCNF.

B. The relation $team$ is NOT in 3NF.

C. The decomposition constitutes a lossless join.

D. The relation $team$ is NOT in BCNF.

Question Type : **MSQ**
Question ID : **1422765968**
Status : **Answered**
Chosen Option : **A,C**

Q.44 A disk of size 512M bytes is divided into blocks of 64K bytes. A file is stored in the disk using linked allocation. In linked allocation, each data block reserves 4 bytes to store the pointer to the next data block. The link part of the last data block contains a *NULL* pointer (also of 4 bytes). Suppose a file of 1M bytes needs to be stored in the disk. Assume, $1K = 2^{10}$ and $1M = 2^{20}$. The amount of space in bytes that will be wasted due to internal fragmentation is _____. (Answer in integer)

Give --
n
Ans
wer :

Question Type : **NAT**
Question ID : **1422765972**
Status : **Not Answered**

Q.45 $A = \{0, 1, 2, 3, \dots\}$ is the set of non-negative integers. Let F be the set of functions from A to itself. For any two functions, $f_1, f_2 \in$ F, we define

$$(f_1 \odot f_2)(n) = f_1(n) + f_2(n)$$

for every number n in A. Which of the following is/are CORRECT about the mathematical structure $(F, \odot)$?

Options
A. $(F, \odot)$ is an Abelian monoid.

B. $(F, \odot)$ is a non-Abelian group.

C. $(F, \odot)$ is an Abelian group.

D. $(F, \odot)$ is a non-Abelian monoid.

> Question Type : **MSQ**
> Question ID : **1422765970**
> Status : **Not Answered**
> Chosen Option : **--**

Q.46 Which of the following predicate logic formulae/formula is/are CORRECT representation(s) of the statement: "*Everyone has exactly one mother*"?

The meanings of the predicates used are:

- $mother(y, x)$: y is the mother of x
- $noteq(x, y)$: x and y are not equal

Options A.
$$\forall x \exists y \big[mother(y, x) \wedge \neg \exists z (noteq(z, y) \wedge mother(z, x)) \big]$$

B. $\forall x \exists y \exists z \big(mother(y, x) \wedge \neg mother(z, x) \big)$

C.
$$\forall x \exists y \big[mother(y, x) \wedge \forall z (noteq(z, y) \rightarrow \neg mother(z, x)) \big]$$

D.
$$\forall x \forall y \big[mother(y, x) \rightarrow \exists z (mother(z, x) \wedge \neg noteq(z, y)) \big]$$

> Question Type : **MSQ**
> Question ID : **1422765969**
> Status : **Answered**
> Chosen Option : **A,B,C**

Q.47 Let $G(V, E)$ be an undirected and unweighted graph with 100 vertices. Let $d(u, v)$ denote the number of edges in a shortest path between vertices u and v in V. Let the maximum value of $d(u, v)$, $u, v \in V$ such that $u \neq v$, be 30. Let T be any breadth-first-search tree of G. Which ONE of the given options is CORRECT for every such graph G?

Options A. The height of T is at least 30.

B. The height of T is exactly 30.

C. The height of T is at least 15.

D. The height of T is exactly 15.

> Question Type : **MCQ**
> Question ID : **1422765964**
> Status : **Answered**
> Chosen Option : **A**

Q.48
```c
#include <stdio.h>
int foo(int S[],int size){
    if(size == 0) return 0;
    if(size == 1) return 1;
    if(S[0] != S[1]) return 1+foo(S+1,size-1);
    return foo(S+1,size-1);
}
int main(){
    int A[]={0,1,2,2,2,0,0,1,1};
    printf("%d",foo(A,9));
    return 0;
}
```

The value printed by the given C program is _____ . (Answer in integer)
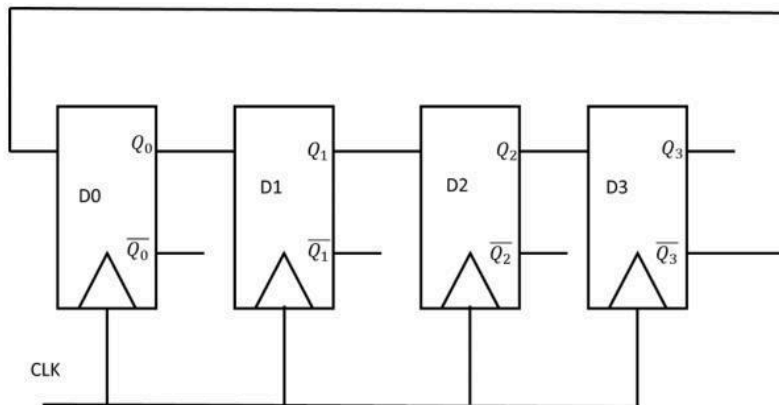
Give
n
Ans
wer : **5**

Question Type : **NAT**

Question ID : **1422765982**

Status : **Answered**

Q.49 Consider the given sequential circuit designed using D-Flip-flops. The circuit is initialized with some value (initial state). The number of distinct states the circuit will go through before returning back to the initial state is _____ . (Answer in integer)

Give --
n
Ans
wer :

Question Type : **NAT**

Question ID : **1422765981**

Status : **Not Answered**

Q.50 Consider the following database tables of a sports league.

    `player(pid,pname,age)`   `team(tid,tname,city,cid)`
    `coach(cid,cname)`   `members(pid,tid)`

An instance of the table and an SQL query are given.

player

pid	pname	age
1	Jasprit	31
2	Atharva	24
3	Ishan	26
4	Axar	30

coach

cid	cname
101	Ricky
102	Mark
103	Trevor

team

tid	tname	city	cid
10	MI	Mumbai	102
20	DC	Delhi	101
30	PK	Mohali	103

members

pid	tid
1	10
2	30
3	10
4	20

```
SELECT MIN(P.age)
FROM player P
WHERE P.pid IN (
    SELECT M.pid
    FROM team T, coach C, members M
    WHERE C.cname = 'Mark'
        AND T.cid = C.cid
        AND M.tid = T.tid
    )
```

The value returned by the given SQL query is _____ . (Answer in integer)

Given Answer : **26**

Question Type : **NAT**
Question ID : **1422765976**
Status : **Answered**

Q.51 Consider the following four variable Boolean function in sum-of-product form

$$F(b_3, b_2, b_1, b_0) = \sum(0, 2, 4, 8, 10, 11, 12).$$

where the value of the function is computed by considering $b_3 b_2 b_1 b_0$ as a 4-bit binary number, where b_3 denotes the most significant bit and b_0 denotes the least significant bit. Note that there are no don't care terms. Which ONE of the following options is the CORRECT minimized Boolean expression for F?

Options

A. $\bar{b}_2 \bar{b}_0 + b_1 b_2 b_3$

B. $\bar{b}_1 \bar{b}_0 + \bar{b}_2 \bar{b}_0$

C. $\bar{b}_1 \bar{b}_0 + \bar{b}_2 \bar{b}_0 + b_1 \bar{b}_2 b_3$

D. $\bar{b}_0 \bar{b}_2 + \bar{b}_3$

Question Type : **MCQ**
Question ID : **1422765963**
Status : **Not Answered**
Chosen Option : **--**

Q.52 Consider a finite state machine (FSM) with one input X and one output f, represented by the given state transition table. The minimum number of states required to realize this FSM is _____. (Answer in integer)

Present state	Next state		Output f	
	$X = 0$	$X = 1$	$X = 0$	$X = 1$
A	F	B	0	0
B	D	C	0	0
C	F	E	0	0
D	G	A	1	0
E	D	C	0	0
F	F	B	1	1
G	G	H	0	1
H	G	A	1	0

Give n Answer : **5**

Question Type : **NAT**

Question ID : **1422765980**

Status : **Marked For Review**

Q.53 Suppose a message of size 15000 bytes is transmitted from a source to a destination using IPv4 protocol via two routers as shown in the figure. Each router has a defined maximum transmission unit (MTU) as shown in the figure, including IP header. The number of fragments that will be delivered to the destination is _____ . (Answer in integer)

Source → Router-1 (MTU=5000 bytes) → Router-2 (MTU=3000 bytes) → Destination

Give n Answer : **6**
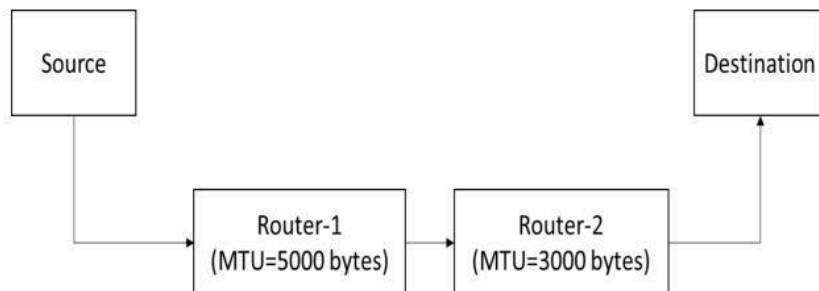
Question Type : **NAT**

Question ID : **1422765978**

Status : **Marked For Review**

Q.54 A processor has 64 general-purpose registers and 50 distinct instruction types. An instruction is encoded in 32-bits. What is the maximum number of bits that can be used to store the immediate operand for the given instruction?

```
    ADD R1, #25      // R1 = R1 + 25
```

Options A. 16

B. 20

C. 24

D. 22

Question Type : **MCQ**

Question ID : **1422765958**

Status : **Not Answered**

Chosen Option : **--**

Q.55 Which of the following statement(s) is/are TRUE while computing *First* and *Follow* during top down parsing by a compiler?

Options A.
If there is any input right end marker, it will be added to $First(S)$, where S is the start symbol.

B. For a production $A \rightarrow \epsilon$, ϵ will be added to $First(A)$.

C.
If there is any input right end marker, it will be added to $Follow(S)$, where S is the start symbol.

D. For a production $A \rightarrow \epsilon$, ϵ will be added to $Follow(A)$.

Question Type : **MSQ**

Question ID : **1422765967**

Status : **Marked For Review**

Chosen Option : **A,D**