Graduate Aptitude Test in Engineering 3rd Feb 2019 S1

Participant ID	CS19S32076040
Participant Name	PAL GAURAV NANDKUMAR
Test Center Name	iON Digital Zone iDZ Turbhe SK Wheels
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Subject	Computer Science and Information Technology

Section : **General Aptitude**

Q.1 A court is to a judge as _____ is to a teacher.

Options
1. a school
2. a punishment
3. a syllabus
4. a student

Question ID : **27292910795**
Status : **Not Answered**
Chosen Option : **--**

Q.2 Ten friends planned to share equally the cost of buying a gift for their teacher. When two of them decided not to contribute, each of the other friends had to pay Rs 150 more. The cost of the gift was Rs. _____.

Options
1. 6000
2. 3000
3. 666
4. 12000

Question ID : **27292910794**
Status : **Answered**
Chosen Option : **1**

Q.3 The search engine's business model _____ around the fulcrum of trust.

Options 1. revolves

2. plays

3. sinks

4. bursts

Question ID : **27292910792**

Status : **Answered**

Chosen Option : **1**

Q.4 The expenditure on the project _____ as follows: equipment Rs.20 lakhs, salaries Rs.12 lakhs, and contingency Rs.3 lakhs.

Options 1. break

2. break down

3. breaks

4. breaks down

Question ID : **27292910791**

Status : **Not Answered**

Chosen Option : **--**

Q.5 Two cars start at the same time from the same location and go in the same direction. The speed of the first car is 50 km/h and the speed of the second car is 60 km/h. The number of hours it takes for the distance between the two cars to be 20 km is ___.

Options 1. 2

2. 1

3. 3

4. 6

Question ID : **27292910793**

Status : **Answered**

Chosen Option : **2**

Q.6

In the given diagram, teachers are represented in the triangle, researchers in the circle and administrators in the rectangle. Out of the total number of the people, the percentage of administrators shall be in the range of _____.
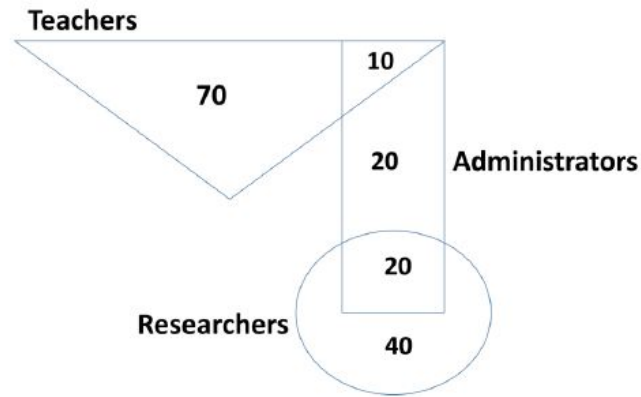
Options
1. 16 to 30

2. 46 to 60

3. 0 to 15

4. 31 to 45

Q.7

The police arrested four criminals – P, Q, R and S. The criminals knew each other. They made the following statements:

P says "Q committed the crime."

Q says "S committed the crime."

R says "I did not do it."

S says "What Q said about me is false."

Assume only one of the arrested four committed the crime and only one of the statements made above is true. Who committed the crime?
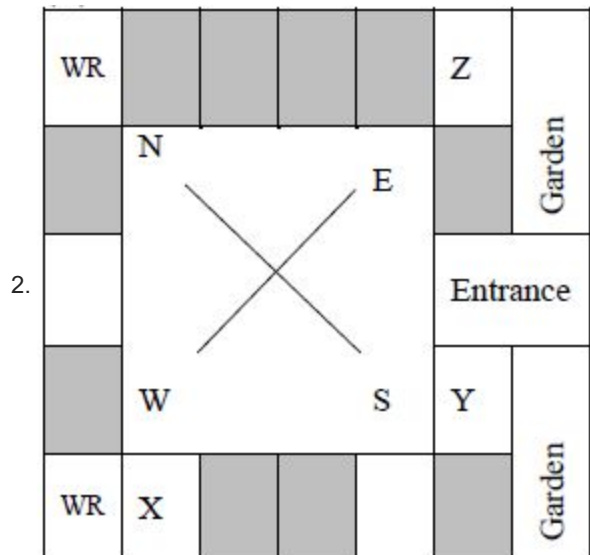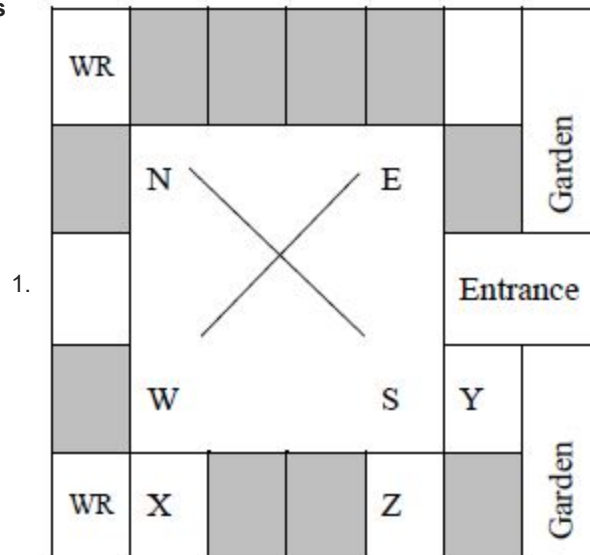
Options
1. P

2. S

3. R

4. Q

**Q.8** Three of the five students allocated to a hostel put in special requests to the warden. Given the floor plan of the vacant rooms, select the allocation plan that will accommodate all their requests.
Request by X: Due to pollen allergy, I want to avoid a wing next to the garden.
Request by Y: I want to live as far from the washrooms as possible, since I am very sensitive to smell.
Request by Z: I believe in Vaastu and so want to stay in the South-west wing.
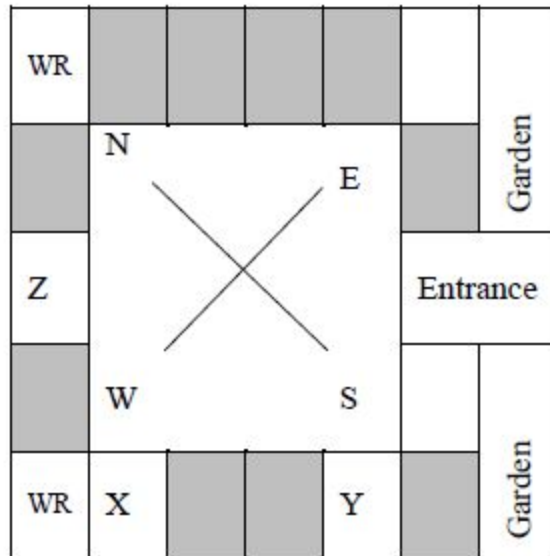The shaded rooms are already occupied. WR is washroom.

Options
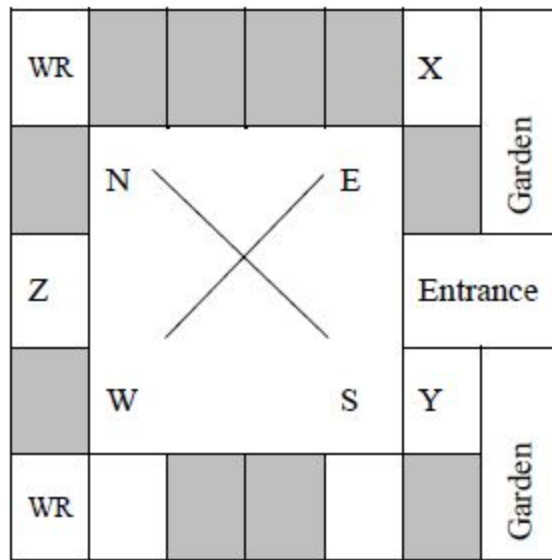
1.

2.

3.

4.

Q.9   "A recent High Court judgement has sought to dispel the idea of begging as a disease —
which leads to its stigmatization and criminalization — and to regard it as a symptom. The
underlying disease is the failure of the state to protect citizens who fall through the social
security net."

Which one of the following statements can be inferred from the given passage?

Options 1.
Beggars are created because of the lack of social welfare schemes

2.
Begging has to be banned because it adversely affects the welfare of the state

3. Begging is an offence that has to be dealt with firmly

4.
Beggars are lazy people who beg because they are unwilling to work

Q.10

In a college, there are three student clubs. Sixty students are only in the Drama club, 80 students are only in the Dance club, 30 students are only in the Maths club, 40 students are in both Drama and Dance clubs, 12 students are in both Dance and Maths clubs, 7 students are in both Drama and Maths clubs, and 2 students are in all the clubs. If 75% of the students in the college are not in any of these clubs, then the total number of students in the college is _____.

Options 1. 975

2. 900

3. 1000

4. 225

Section : **CS COMPUTER SCIENCE AND INFORMATION TECHNOLOGY**

Q.1

Let X be a square matrix. Consider the following two statements on X.
    I. X is invertible.
    II.   Determinant of X is non-zero.

Which one of the following is TRUE?

Options 1. I does not imply II; II does not imply I.

2. I and II are equivalent statements.

3. II implies I; I does not imply II.

4. I implies II; II does not imply I.

Q.2

If L is a regular language over $\Sigma = \{a, b\}$, which one of the following languages is NOT regular ?

Options 1. Prefix $(L) = \{x \in \Sigma^* | \exists y \in \Sigma^*$ such that $xy \in L\}$

2. Suffix $(L) = \{y \in \Sigma^* | \exists x \in \Sigma^*$ such that $xy \in L\}$

3. $\{ww^R \mid w \in L\}$

4. $L \cdot L^R = \{xy \mid x \in L, y^R \in L\}$

Q.3

Consider the grammar given below:

$S \rightarrow Aa$
$A \rightarrow BD$
$B \rightarrow b \mid \epsilon$
$D \rightarrow d \mid \epsilon$

Let a, b, d, and $ be indexed as follows:

a	b	d	$
3	2	1	0

Compute the FOLLOW set of the non-terminal B and write the index values for the symbols in the FOLLOW set in the descending order. (For example, if the FOLLOW set is {a, b, d, $}, then the answer should be 3210)

Answer: _____.

Q.4

A certain processor uses a fully associative cache of size 16 kB. The cache block size is 16 bytes. Assume that the main memory is byte addressable and uses a 32-bit address. How many bits are required for the *Tag* and the *Index* fields respectively in the addresses generated by the processor?

Options
1. 28 bits and 0 bits

2. 24 bits and 0 bits

3. 24 bits and 4 bits

4. 28 bits and 4 bits

Question ID : **27292910801**

Status : **Not Attempted and Marked For Review**

Chosen Option : --

Q.5

An array of 25 distinct elements is to be sorted using quicksort. Assume that the pivot element is chosen uniformly at random. The probability that the pivot element gets placed in the worst possible location in the first round of partitioning (rounded off to 2 decimal places) is _____.

Question ID : **27292910820**

Status : **Answered**

Given Answer : **0.08**

Q.6 Consider the following two statements about database transaction schedules:

I. Strict two-phase locking protocol generates conflict serializable schedules that are also recoverable.

II. Timestamp-ordering concurrency control protocol with Thomas' Write Rule can generate view serializable schedules that are not conflict serializable.

Which of the above statements is/are TRUE?

Options
1. I only

2. Neither I nor II

3. Both I and II

4. II only

Question ID : **27292910811**

Status : **Answered**

Chosen Option : **1**

Q.7

Consider the following C program:

```c
#include <stdio.h>
int jumble(int x, int y){
    x=2*x+y;
    return x;
}
int main(){
    int x=2, y=5;
    y=jumble(y,x);
    x=jumble(y,x);
    printf("%d \n", x);
    return 0;
}
```

The value printed by the program is _____.

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Question ID : **27292910818**

Status : **Answered**

Given Answer : **22**

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Q.8

Which of the following protocol pairs can be used to send and retrieve e-mails (in that order)?

Options 1. IMAP, POP3

2. SMTP, MIME

3. SMTP, POP3

4. IMAP, SMTP

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Question ID : **27292910816**

Status : **Answered**

Chosen Option : **3**

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Q.9

Two numbers are chosen independently and uniformly at random from the set $\{1, 2, \ldots, 13\}$.
The probability (rounded off to 3 decimal places) that their 4-bit (unsigned) binary representations have the same most significant bit is _____.

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Question ID : **27292910822**

Status : **Not Attempted and Marked For Review**

Given Answer : **--**

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Q.10

Compute $\lim\limits_{x \to 3} \dfrac{x^4 - 81}{2x^2 - 5x - 3}$

Options 1. Limit does not exist

2. 108/7

3. 53/12

4. 1

Question ID : **27292910813**

Status : **Answered**

Chosen Option : **2**

Q.11

Consider a sequence of 14 elements: $A = [-5, -10, 6, 3, -1, -2, 13, 4, -9, -1, 4, 12, -3, 0]$. The subsequence sum $S(i, j) = \sum_{k=i}^{j} A[k]$. Determine the maximum of $S(i, j)$, where $0 \le i \le j < 14$. (Divide and conquer approach may be used.)

Answer: _____.

Question ID : **27292910825**

Status : **Not Attempted and Marked For Review**

Given Answer : **--**

Q.12

In 16-bit 2's complement representation, the decimal number -28 is:

Options 1. 1111 1111 0001 1100

2. 1000 0000 1110 0100

3. 1111 1111 1110 0100

4. 0000 0000 1110 0100

Question ID : **27292910804**

Status : **Answered**

Chosen Option : **3**

Q.13

Consider three concurrent processes P1, P2 and P3 as shown below, which access a shared variable D that has been initialized to 100.

P1	P2	P3
:	:	:
:	:	:
$D = D + 20$	$D = D - 50$	$D = D + 10$
:	:	:
:	:	:

The processes are executed on a uniprocessor system running a time-shared operating system. If the minimum and maximum possible values of D after the three processes have completed execution are X and Y respectively, then the value of $Y - X$ is _____.

Q.14 Which one of the following is NOT a valid identity?

Options 1. $x \oplus y = (xy + x'y')'$

2. $(x + y) \oplus z = x \oplus (y + z)$

3. $x \oplus y = x + y$, if $xy = 0$

4. $(x \oplus y) \oplus z = x \oplus (y \oplus z)$

Q.15 For $\Sigma = \{a, b\}$, let us consider the regular language $L = \{ x \mid x = a^{2+3k} \text{ or } x = b^{10+12k}$, $k \geq 0\}$. Which one of the following can be a pumping length (the constant guaranteed by the pumping lemma) for L ?

Options 1. 3

2. 9

3. 24

4. 5

Q.16 Let G be an undirected complete graph on n vertices, where $n > 2$. Then, the number of different Hamiltonian cycles in G is equal to

Options

1. $\dfrac{(n-1)!}{2}$

2. $n!$

3. 1

4. $(n-1)!$

Question ID : **27292910812**

Status : **Answered**

Chosen Option : **4**

Q.1 7 The value of $3^{51} \bmod 5$ is _____.

Question ID : **27292910821**

Status : **Marked For Review**

Given Answer : **50**

Q.18 Which one of the following statements is NOT correct about the B+ tree data structure used for creating an index of a relational database table?

Options 1. B+ Tree is a height-balanced tree

2. Non-leaf nodes have pointers to data records

3. Each leaf node has a pointer to the next leaf node

4. Key values in each node are kept in sorted order

Question ID : **27292910814**

Status : **Answered**

Chosen Option : **2**

Q.19 Which one of the following kinds of derivation is used by LR parsers?

1. Rightmost in reverse

2. Rightmost

3. Leftmost

4. Leftmost in reverse

Question ID : **27292910803**

Status : **Answered**

Chosen Option : **4**

Q.20 Let $U = \{1,2, ..., n\}$. Let $A = \{(x, X)|x \in X, X \subseteq U\}$. Consider the following two statements on $|A|$.

I. $|A| = n2^{n-1}$

II. $|A| = \sum_{k=1}^{n} k\binom{n}{k}$

Which of the above statements is/are TRUE?

Options 1. Neither I nor II

2. Both I and II

3. Only II

4. Only I

Question ID : **27292910805**

Status : **Not Attempted and Marked For Review**

Chosen Option : **--**

Q.21 The following C program is executed on a Unix/Linux system:

```
#include <unistd.h>
int main()
{
        int i;
        for (i=0; i<10; i++)
                if (i%2 == 0) fork();
        return 0;
}
```

The total number of child processes created is _____.

Question ID : **27292910817**

Q.22

Let G be an arbitrary group. Consider the following relations on G:

R_1: $\forall a, b \in G$, $a\,R_1 b$ if and only if $\exists g \in G$ such that $a = g^{-1}bg$

R_2: $\forall a, b \in G$, $a\,R_2 b$ if and only if $a = b^{-1}$

Which of the above is/are equivalence relation/relations?

Options 1. R_2 only

2. R_1 and R_2

3. R_1 only

4. Neither R_1 nor R_2

Question ID : **27292910810**

Status : **Not Attempted and Marked For Review**

Chosen Option : **--**

Q.23

Consider the following C program:

```c
#include <stdio.h>
int main(){
        int arr[]={1,2,3,4,5,6,7,8,9,0,1,2,5}, *ip=arr+4;
        printf("%d\n", ip[1]);
        return 0;
}
```

The number that will be displayed on execution of the program is_____.

Question ID : **27292910824**

Status : **Answered**

Given Answer : **6**

Q.24

The chip select logic for a certain DRAM chip in a memory system design is shown below. Assume that the memory system has 16 address lines denoted by A_{15} to A_0. What is the range of addresses (in hexadecimal) of the memory system that can get enabled by the chip select (CS) signal?
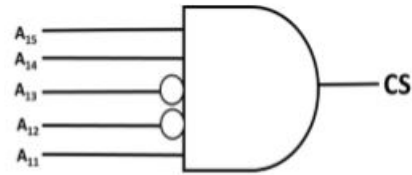
Options 1. CA00 to CAFF

2. C800 to C8FF

3. DA00 to DFFF

4. C800 to CFFF

Q.25 Consider $Z = X - Y$, where X, Y and Z are all in sign-magnitude form. X and Y are each represented in n bits. To avoid overflow, the representation of Z would require a minimum of:
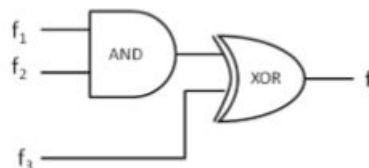
Options 1. n bits

2. $n - 1$ bits

3. $n + 1$ bits

4. $n + 2$ bits

Q.26 Consider three 4-variable functions f_1, f_2, and f_3, which are expressed in sum-of-minterms as

$f_1 = \Sigma\ (0, 2, 5, 8, 14)$, $f_2 = \Sigma\ (2, 3, 6, 8, 14, 15)$, $f_3 = \Sigma\ (2, 7, 11, 14)$

For the following circuit with one AND gate and one XOR gate, the output function f can be expressed as:

Options 1. $\Sigma\,(2, 14)$

2. $\Sigma\,(7, 8, 11)$

3. $\Sigma\,(2, 7, 8, 11, 14)$

4. $\Sigma\,(0, 2, 3, 5, 6, 7, 8, 11, 14, 15)$

Q.27

Consider the following C function.

```
void convert(int n){
    if(n<0)
        printf("%d",n);
    else {
        convert(n/2);
        printf("%d",n%2);
    }
}
```

Which one of the following will happen when the function convert is called with any positive integer n as argument?

Options 1. It will print the binary representation of n but will not terminate

2.
It will print the binary representation of n in the reverse order and terminate

3. It will print the binary representation of n and terminate

4. It will not print anything and will not terminate

Q.28

Consider the following snapshot of a system running n concurrent processes. Process i is holding X_i instances of a resource R, $1 \le i \le n$. Assume that all instances of R are currently in use. Further, for all i, process i can place a request for at most Y_i additional instances of R while holding the X_i instances it already has. Of the n processes, there are exactly two processes p and q such that $Y_p = Y_q = 0$. Which one of the following conditions guarantees that no other process apart from p and q can complete execution?

Options 1. $\text{Min}\,(X_p, X_q) \ge \text{Min}\,\{Y_k \mid 1 \le k \le n, k \ne p, k \ne q\}$

2. $X_p + X_q < \text{Min}\,\{Y_k \mid 1 \le k \le n, k \ne p, k \ne q\}$

3. $X_p + X_q < \text{Max} \{Y_k \mid 1 \le k \le n, k \ne p, k \ne q\}$

4. $\text{Min}(X_p, X_q) \le \text{Max} \{Y_k \mid 1 \le k \le n, k \ne p, k \ne q\}$

Q.29 Consider three machines M, N, and P with IP addresses 100.10.5.2, 100.10.5.5, and 100.10.5.6 respectively. The subnet mask is set to 255.255.255.252 for all the three machines. Which one of the following is true?

Options 1. M, N, and P belong to three different subnets

2. Only N and P belong to the same subnet

3. M, N, and P all belong to the same subnet

4. Only M and N belong to the same subnet

Q.30 The index node (inode) of a Unix-like file system has 12 direct, one single-indirect and one double-indirect pointers. The disk block size is 4 kB, and the disk block address is 32-bits long. The maximum possible file size is (rounded off to 1 decimal place) _____ GB.

Q.31 Consider that 15 machines need to be connected in a LAN using 8-port Ethernet switches. Assume that these switches do not have any separate uplink ports. The minimum number of switches needed is_____.

Q.32

Consider the following matrix:

$$R = \begin{bmatrix} 1 & 2 & 4 & 8 \\ 1 & 3 & 9 & 27 \\ 1 & 4 & 16 & 64 \\ 1 & 5 & 25 & 125 \end{bmatrix}$$

The absolute value of the product of Eigen values of R is _____.

Q.33

There are n unsorted arrays: $A_1, A_2, ..., A_n$. Assume that n is odd. Each of $A_1, A_2, ..., A_n$ contains n distinct elements. There are no common elements between any two arrays. The worst-case time complexity of computing the median of the medians of $A_1, A_2, ..., A_n$ is

Options
1. $O(n)$

2. $O(n^2)$

3. $O(n \log n)$

4. $\Omega(n^2 \log n)$

Q.34

Consider the following C program:

```c
#include <stdio.h>
int main()
{
    int a[] = {2, 4, 6, 8, 10};
    int i, sum = 0, *b = a + 4;
    for (i = 0; i < 5; i++)
        sum = sum + (*b - i) - *(b - i);
    printf ("%d\n", sum);
    return 0;
}
```

The output of the above C program is _____.

Q.35
Consider the following grammar and the semantic actions to support the inherited type declaration attributes. Let $X_1, X_2, X_3, X_4, X_5,$ and X_6 be the placeholders for the non-terminals D, T, L or L_1 in the following table:

Production rule	Semantic action
D → T L	X_1.type = X_2.type
T → int	T.type = int
T → float	T.type = float
L → L_1 , id	X_3.type = X_4.type addType(id.entry, X_5.type)
L → id	addType(id.entry, X_6.type)

Which one of the following are the appropriate choices for X_1, X_2, X_3 and X_4?

Options
1. $X_1 = L , X_2 = T, X_3 = L_1, X_4 = L$

2. $X_1 = L , X_2 = L, X_3 = L_1, X_4 = T$

3. $X_1 = T , X_2 = L, X_3 = T, X_4 = L_1$

4. $X_1 = T , X_2 = L, X_3 = L_1, X_4 = T$

Q.36 Consider the augmented grammar given below:

$$S' \to S$$
$$S \to \langle L \rangle \mid id$$
$$L \to L,S \mid S$$

Let $I_0 = \text{CLOSURE}(\{[S' \to \bullet S]\})$. The number of items in the set GOTO $(I_0, \langle\ )$ is:

_____.

Q.37

Which one of the following languages over $\Sigma = \{a, b\}$ is NOT context-free?

Options 1. $\{wa^n b^n w^R \mid w \in \{a, b\}^*, n \geq 0\}$

2. $\{wa^n w^R b^n \mid w \in \{a, b\}^*, n \geq 0\}$

3. $\{ww^R \mid w \in \{a, b\}^*\}$

4. $\{a^n b^i \mid i \in \{n, 3n, 5n\}, n \geq 0\}$

Q.38

Consider the following C program:

```c
#include <stdio.h>
int r(){
        static int num=7;
        return num--;
}

int main(){
        for (r();r();r())
                printf("%d",r());
        return 0;
}
```

Which one of the following values will be displayed on execution of the programs?

Options 1. 630

2. 41

3. 63

4. 52

Q.39 Consider the following four processes with arrival times (in milliseconds) and their length of CPU bursts (in milliseconds) as shown below:

Process	P1	P2	P3	P4
Arrival time	0	1	3	4
CPU burst time	3	1	3	Z

These processes are run on a single processor using preemptive Shortest Remaining Time First scheduling algorithm. If the average waiting time of the processes is 1 millisecond, then the value of Z is_____.

Q.40 Let T be a full binary tree with 8 leaves. (A full binary tree has every level full.) Suppose two leaves a and b of T are chosen uniformly and independently at random. The expected value of the distance between a and b in T (i.e., the number of edges in the unique path between a and b) is (rounded off to 2 decimal places) _____.

Q.41 Consider the following statements:
- I.   The smallest element in a max-heap is always at a leaf node
- II. The second largest element in a max-heap is always a child of the root node
- III. A max-heap can be constructed from a binary search tree in $\Theta(n)$ time
- IV. A binary search tree can be constructed from a max-heap in $\Theta(n)$ time

Which of the above statements are TRUE?

Options

1. I, II and III

2. I, III and IV

3. II, III and IV

4. I, II and IV

Q.42 Consider the following sets:

S1. Set of all recursively enumerable languages over the alphabet {0,1}
S2. Set of all syntactically valid C programs
S3. Set of all languages over the alphabet {0,1}
S4. Set of all non-regular languages over the alphabet {0,1}

Which of the above sets are uncountable?

Options 1. S3 and S4

2. S1 and S4

3. S1 and S2

4. S2 and S3

Q.43 Let the set of functional dependencies F = {QR → S, R → P, S → Q} hold on a relation schema X = (PQRS). X is not in BCNF. Suppose X is decomposed into two schemas Y and Z, where Y = (PR) and Z = (QRS).

Consider the two statements given below.

I.   Both Y and Z are in BCNF
II. Decomposition of X into Y and Z is dependency preserving and lossless

Which of the above statements is/are correct?

Options 1. I only

2. II only

3. Neither I nor II

4. Both I and II

Q.44 Let G be any connected, weighted, undirected graph.

I. G has a unique minimum spanning tree, if no two edges of G have the same weight.
II. G has a unique minimum spanning tree, if, for every cut of G, there is a unique minimum-weight edge crossing the cut.

Which of the above two statements is/are TRUE?

Options
1. Neither I nor II

2. Both I and II

3. II only

4. I only

Q.45 What is the minimum number of 2-input NOR gates required to implement a 4-variable function expressed in sum-of-minterms form as $f = \Sigma\,(0, 2, 5, 7, 8, 10, 13, 15)$? Assume that all the inputs and their complements are available. Answer: _____.

Q.46

Consider the first order predicate formula φ:

$\forall x\ [(\forall z\ z|x \Rightarrow ((z = x) \vee (z = 1))) \Rightarrow \exists w\ (w > x) \wedge (\forall z\ z|w \Rightarrow ((w = z) \vee (z = 1)))]$

Here '$a|b$' denotes that 'a divides b', where a and b are integers. Consider the following sets:

S1. $\{1,2,3, \ldots, 100\}$
S2. Set of all positive integers
S3. Set of all integers

Which of the above sets satisfy φ?

Options
1. S2 and S3

2. S1 and S3

3. S1, S2 and S3

4. S1 and S2

Question ID : **27292910835**
Status : **Not Answered**
Chosen Option : --

Q.47 Assume that in a certain computer, the virtual addresses are 64 bits long and the physical addresses are 48 bits long. The memory is word addressible. The page size is 8 kB and the word size is 4 bytes. The Translation Look-aside Buffer (TLB) in the address translation path has 128 valid entries. At most how many distinct virtual addresses can be translated without any TLB miss?

Options
1. 16×2^{10}

2. 4×2^{20}

3. 256×2^{10}

4. 8×2^{20}

Question ID : **27292910833**
Status : **Answered**
Chosen Option : **3**

Q.4
8

Consider the following relations P(X,Y,Z), Q(X,Y,T) and R(Y,V).

P				Q				R	
X	**Y**	**Z**		**X**	**Y**	**T**		**Y**	**V**
X1	Y1	Z1		X2	Y1	2		Y1	V1
X1	Y1	Z2		X1	Y2	5		Y3	V2
X2	Y2	Z2		X1	Y1	6		Y2	V3
X2	Y4	Z4		X3	Y3	1		Y2	V2

How many tuples will be returned by the following relational algebra query?

$$\prod_X \left(\sigma_{(P.Y=R.Y \, \wedge \, R.V=V2)}(P \times R)\right) - \prod_X \left(\sigma_{(Q.Y=R.Y \, \wedge \, Q.T>2)}(Q \times R)\right)$$

Answer: _____.

Q.4 9 Consider the following C program:

```
#include <stdio.h>
int main(){
    float sum = 0.0, j = 1.0, i = 2.0;
    while (i/j > 0.0625){
        j = j + j;
        sum = sum + i/j;
        printf("%f\n", sum);
    }
    return 0;
}
```

The number of times the variable sum will be printed, when the above program is executed, is _____.

Q.5 0

A relational database contains two tables Student and Performance as shown below:

Student

Roll_no.	Student_name
1	Amit
2	Priya
3	Vinit
4	Rohan
5	Smita

Performance

Roll_no.	Subject_code	Marks
1	A	86
1	B	95
1	C	90
2	A	89
2	C	92
3	C	80

The primary key of the Student table is Roll_no. For the Performance table, the columns Roll_no. and Subject_code together form the primary key. Consider the SQL query given below:

```
SELECT S.Student_name, sum(P.Marks)
FROM Student S, Performance P
WHERE P.Marks > 84
GROUP BY S.Student_name;
```

The number of rows returned by the above SQL query is _____.

Q.51 Suppose that in an IP-over-Ethernet network, a machine X wishes to find the MAC address of another machine Y in its subnet. Which one of the following techniques can be used for this?

Options 1.

X sends an ARP request packet to the local gateway's MAC address which then finds the MAC address of Y and sends to X

2.

X sends an ARP request packet with broadcast IP address in its local subnet

3.

X sends an ARP request packet with broadcast MAC address in its local subnet

4.

X sends an ARP request packet to the local gateway's IP address which then finds the MAC address of Y and sends to X

Q.5

2

A certain processor deploys a single-level cache. The cache block size is 8 words and the word size is 4 bytes. The memory system uses a 60-MHz clock. To service a cache miss, the memory controller first takes 1 cycle to accept the starting address of the block, it then takes 3 cycles to fetch all the eight words of the block, and finally transmits the words of the requested block at the rate of 1 word per cycle. The maximum bandwidth for the memory system when the program running on the processor issues a series of read operations is _____ $\times 10^6$ bytes/sec.

Q.5
3

In an RSA cryptosystem, the value of the public modulus parameter n is 3007. If it is also known that $\varphi(n) = 2880$, where $\varphi()$ denotes Euler's Totient Function, then the prime factor of n which is greater than 50 is _____.

Q.5
4

Let Σ be the set of all bijections from $\{1, \dots, 5\}$ to $\{1, \dots, 5\}$, where id denotes the identity function, i.e. $id(j) = j, \forall j$. Let $\circ$ denote composition on functions. For a string $x = x_1 x_2 \cdots x_n \in \Sigma^n, n \geq 0$, let $\pi(x) = x_1 \circ x_2 \circ \cdots \circ x_n$.
Consider the language $L = \{x \in \Sigma^* | \pi(x) = id \}$. The minimum number of states in any DFA accepting L is _____.

Q.5
5

Suppose Y is distributed uniformly in the open interval $(1,6)$. The probability that the polynomial $3x^2 + 6xY + 3Y + 6$ has only real roots is (rounded off to 1 decimal place) _____.