Summary in Graph

Exam Summary (GO Classes Test Series 2024 | Mock GATE | Test 12)

Qs. Attempted:	**51** 24 + 27	**Correct Marks:**	**54** 18 + 36
Correct Attempts:	**36** 18 + 18	**Penalty Marks:**	**3.67** 1.67 + 2
Incorrect Attempts:	**15** 6 + 9	**Resultant Marks:**	**50.33** 16.33 + 34

Total Questions:	**65** 30 + 35
Total Marks:	**100** 30 + 70
Exam Duration:	**180 Minutes**
Time Taken:	**180 Minutes**

EXAM RESPONSE   EXAM STATS   FEEDBACK

Aptitude

Q #1 Multiple Choice Type   Award: 1   Penalty: 0.33   Quantitative Aptitude

If $2^n = 8^{20}$, what is the value of n?

A. 10
B. 60
C. 40
D. 16

Your Answer: B   **Correct Answer: B**   Correct   Discuss

Q #2 Multiple Choice Type   Award: 1   Penalty: 0.33   Quantitative Aptitude

If n is a positive integer, the notation $n!$ (read " n factorial") is used to represent the product of the integers from 1 to n inclusive. For example, $5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$. Which of the following is equal to a perfect square?

A. $\dfrac{(20!)(19!)}{2}$

B. $\dfrac{(20!)(19!)}{3}$

C. $\dfrac{(20!)(19!)}{4}$

D. $\dfrac{(20!)(19!)}{5}$

Your Answer: D | **Correct Answer: D** | Correct | Discuss

Q #3 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Verbal Aptitude

Kathy owns more cats than Alice and more dogs than Bruce. Alice owns more dogs than Kathy and fewer cats than Bruce. Which of the statements must be true?

A. Bruce owns the fewest cats.
B. Bruce owns the most cats.
C. Kathy owns the most cats.
D. Alice owns the most dogs.

Your Answer: D | **Correct Answer: D** | Correct | Discuss

Q #4 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Quantitative Aptitude

Each of $a, b, c,$ and d is a positive integer and is greater than 3. If

$$\frac{1}{a-2} = \frac{1}{b+2} = \frac{1}{c+1} = \frac{1}{d-3}$$

then which ordering of these four numbers is correct?

A. $a < b < c < d$
B. $c < b < a < d$
C. $b < a < c < d$
D. $b < c < a < d$

Your Answer: D | **Correct Answer: D** | Correct | Discuss

Q #5 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Verbal Aptitude

I don't know the time _____

A. at which the accident happened
B. the accident happened
C. when the accident happened
D. when the accident had happened

Your Answer: B | **Correct Answer: C** | Incorrect | Discuss

Q #6 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Quantitative Aptitude

There are real numbers a and b for which the function f has the properties that $f(x) = ax + b$ for all real numbers x, and $f(bx + a) = x$ for all real numbers x. What is the value of $a + b$?

A. 2
B. -1
C. 0
D. -2

Your Answer: D **Correct Answer: D** Correct Discuss

Q #7 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

In the sum shown, P, Q and R represent three different single digits. The value of $P + Q + R$ is _____.

$$
\begin{array}{r}
P\,7\,R \\
+\quad 3\,9\,R \\
\hline
R\,Q\,0
\end{array}
$$

A. 13
B. 12
C. 14
D. 3

Your Answer: A **Correct Answer: A** Correct Discuss

Q #8 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

A town has 2017 houses. Of these 2017 houses, 1820 have a dog, 1651 have a cat, and 1182 have a turtle. If x is the largest possible number of houses that have a dog, a cat, and a turtle, and y is the smallest possible number of houses that have a dog, a cat, and a turtle, then $x - y$ is _____.

A. 1182
B. 638
C. 563
D. 619

Your Answer: A **Correct Answer: C** Incorrect Discuss

Q #9 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

The integers $1, 2, 4, 5, 6, 9, 10, 11, 13$ are to be placed in the circles and squares below with one number in each shape.

$$\boxed{x}\ \bigcirc\ \square\ \bigcirc\ \square\ \bigcirc\ \square\ \bigcirc\ \boxed{y}$$

Each integer must be used exactly once and the integer in each circle must be equal to the sum of the integers in the two neighbouring squares. If the integer x is placed in the leftmost square and the integer y is placed in the rightmost square, what is the largest possible value of $x + y$?

A. 19
B. 20
C. 21
D. 24

Your Answer: B **Correct Answer: B** Correct Discuss

Q #10 Multiple Choice Type Award: 2 Penalty: 0.67 Verbal Aptitude

Renu saw no _____ in the exercises that had been set for her and worked at them in a _____ manner.

  A. reason...organised
  B. point...desultory
  C. strength...careless
  D. meaning...dutiful

Your Answer: C   Correct Answer: B   Incorrect   Discuss

Technical

Q #1 Multiple Choice Type Award: 1 Penalty: 0.33 Algorithms

Consider the two statements regarding the Huffman's algorithm -

- S1: The character with the highest probability (all probabilities are unique) is guaranteed to be one of the leaves that is closest to the root (i.e it has the least depth among all leaves).
- S2: if all characters occur with probability less than $1/3$, then there is guaranteed to be no codeword of length 1.

Which of the following is CORRECT?

  A. S1 is correct but S2 is false
  B. S1 is false but S2 is correct
  C. Both are correct statements
  D. Both are incorrect statements

Your Answer: D   Correct Answer: C   Incorrect   Discuss

Q #2 Multiple Select Type Award: 1 Penalty: 0 Compiler Design

Consider the following grammar-

$$S \rightarrow bT$$
$$T \rightarrow Ab \mid Ba$$
$$A \rightarrow aS \mid CB$$
$$B \rightarrow bD$$
$$C \rightarrow cD$$
$$D \rightarrow \varepsilon \mid cD$$

Which of the following is/are true about first and follow sets of non-terminals?

  A. $Follow(B)$ and $Follow(D)$ are same.
  B. $Follow(A)$ and $Follow(C)$ are same.
  C. $Follow(S)$ and $Follow(T)$ are same.
  D. $First(A)$ and $First(T)$ are same.

Your Answer: A;B;C   Correct Answer: A;B;C   Correct   Discuss

Q #3 Multiple Choice Type Award: 1 Penalty: 0.33 DS

The Euclidean algorithm is used to find the greatest common divisor (gcd) of two positive integers a and b.

```
input(a)
input(b)
while b>0
    begin
        r:= a mod b
        a:= b
        b:= r
    end
gcd:= a
output(gcd)
```

When the algorithm is used to find the greatest common divisor of $a = 273$ and $b = 110$, which of the following is the sequence of computed values for r?

    A. 2, 53, 1, 0
    B. 53, 2, 1, 0
    C. 53, 4, 1, 0
    D. 53, 5, 1, 0

| Your Answer: C | Correct Answer: C | Correct | Discuss |

Q #4 Multiple Choice Type   Award: 1   Penalty: 0.33   DS

What are the sequence of popped-out values if the sequence of operations -
push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop are performed on a stack?

    A. 2, 2, 1, 1, 2
    B. 2, 2, 1, 1, 1
    C. 2, 1, 2, 2, 1
    D. 2, 1, 2, 2, 2

| Your Answer: A | Correct Answer: A | Correct | Discuss |

Q #5 Numerical Type   Award: 1   Penalty: 0   CO and Architecture

Suppose we have a four-way set associative physically addressed cache of size 256KB and 16B blocks, on a machine that uses 32-bit physical addresses. How many bits will be used for the index?

| Your Answer: 12 | Correct Answer: 12 | Correct | Discuss |

Q #6 Numerical Type   Award: 1   Penalty: 0   Probability

A college has 10 (non-overlapping) time slots for its courses, and assigns courses to time slots randomly and independently. A student randomly chooses 3 of the courses to enroll in. What is the probability that there is a conflict in the student's schedule? (answer upto 2 decimals)

| Your Answer: 0.99 | Correct Answer: 0.28 | Incorrect | Discuss |

Q #7 Multiple Select Type   Award: 1   Penalty: 0   Linear Algebra

Let A be a 20×11 matrix with real entries. After performing some row operations on A, we get a matrix B which has 12 nonzero rows. Which of the following is/are always true?

 A. The rank of A is 12.
 B. The ranks of A and B are not related.
 C. If v is a vector such that $Av = 0$ then Bv is also 0.
 D. The rank of B is at most 11.

| Your Answer: C;D | Correct Answer: C;D | Correct | Discuss |

Q #8 Multiple Choice Type Award: 1 Penalty: 0.33 Operating System

Consider the following program execution involving 2 threads accessing the shared variable a which has been initialised to 0.

Thread 1

```
a++;
while(a < 2);
```

Thread 2

```
a++;
while(a < 2);
```

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

 A. Both threads will never finish execution
 B. Both threads will always finish execution
 C. At least one of the threads will always finish execution
 D. Either both threads will finish, or none of them of will finish execution

---

| Your Answer: D | Correct Answer: D | Correct | Discuss |

Q #9 Numerical Type Award: 1 Penalty: 0 Operating System

Consider a system with 4 GB of physical memory and 64 GB of Virtual Memory. The page size is 4 KB. Recall that the page table is stored in physical memory and consists of PTEs (page table entries). Let's now assume each page could store 2048 PTEs. How many pages does our page table occupy if we have a single-level page table?

| Your Answer: 8192 | Correct Answer: 8192 | Correct | Discuss |

**Q #10** Multiple Select Type Award: 1 Penalty: 0 Computer Networks

Which of the following is/are true in context of error control?

 A. A CRC of length R is calculated over a message of length M bits. The CRC will detect all errors in the message.
 B. The strings 10001 and 11001 have a Hamming distance of one.
 C. If a single parity bit is added to a message, the resulting code set has a minimum Hamming distance of two.
 D. A larger Hamming distance is needed to detect errors than to correct errors.

| Your Answer: | Correct Answer: B;C | Not Attempted | Discuss |

Q #11 Multiple Choice Type Award: 1 Penalty: 0.33 Computer Networks

Host A and B are behind different NATs. A's private IP address is 192.168.1.11, and B's private IP is 10.1.1.12. The public IP of the NAT box connected to A is 4.3.2.1 and the public IP of the NAT box connected to B is 2.2.2.2.
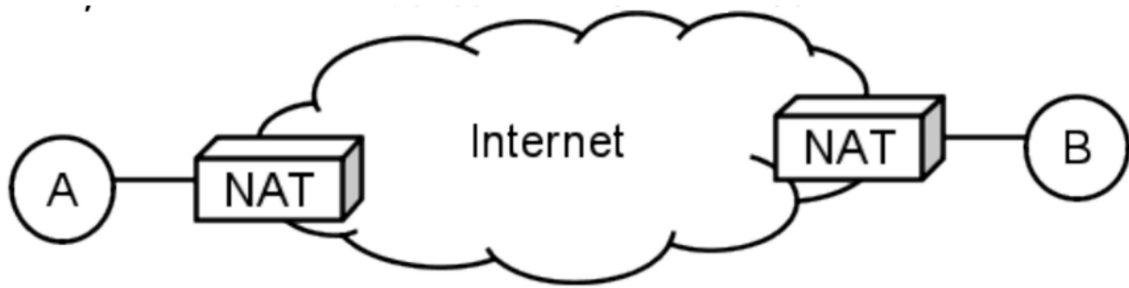
When A sends a packet to B, what should be the destination IP address in the packet leaving A?

    A. 4.3.2.1
    B. 2.2.2.2
    C. 10.1.1.12
    D. 1.2.3.4

Your Answer: **Correct Answer: B**   Not Attempted   Discuss

Q #12   Multiple Choice Type   Award: 1   Penalty: 0.33   Programming in C

Consider the following two declarations for arr1 and arr2 :

```
int arr1[2][3];
int r1[3];
int r2[3];
int * arr2[2] = {r1, r2};
```

Assume that the size of the integer is 4 Bytes and the address size is 8 Bytes.

Which one of the following correctly gives their sizes?

    A. sizeof(arr1) = 8 bytes and sizeof (arr2) = 8 bytes
    B. sizeof (arr1) = 24 bytes and sizeof (arr2) = 16 bytes
    C. sizeof(arr1) = 24 bytes and sizeof (arr2) = 24 bytes
    D. sizeof(arr1) = 48 bytes and sizeof (arr2) = 32 bytes

Your Answer: B   **Correct Answer: B**   Correct   Discuss

Q #13   Numerical Type   Award: 1   Penalty: 0   Programming in C

What will be the output of following program ?

```c
#include <stdio.h>
int thefunction(int a) {
    static int b = 0;
    b++;
    a = a + b;
    return a;
}
int main() {
    int b = 0;
    int i;
    for (i = 1; i <= 3; i++) {
        b = b + thefunction(i);
    }
    printf("%d\n", b);
    return 0;
}
```

Your Answer: 12 **Correct Answer: 12** Correct Discuss

Q #14 Multiple Choice Type Award: 1 Penalty: 0.33 Programming in C

What will be the output of the following program?

```
main()
{
    int a[2][2] = { {1,2},{3,4} };
    int(*p)[2][2];
    p = &a;
    printf("%d", (*p)[0][0]);
}
```

A. 1
B. 3
C. 4
D. None of these

Your Answer: A **Correct Answer: A** Correct Discuss
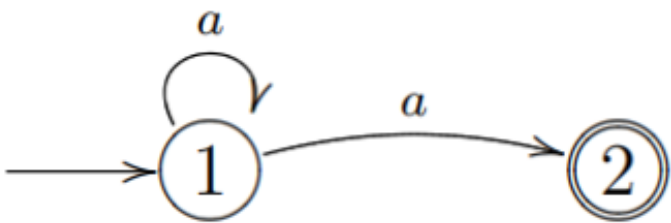

Q #15 Multiple Choice Type Award: 1 Penalty: 0.33 Theory of Computation

Consider the following NFA M and say what language is recognised by constructing the machine that recognises the *complement* of $L(M)$ in $\{a\}^*$.

A. $\emptyset$
B. $\{a\}^*$
C. $\{a\}$
D. $\{\varepsilon\}$

Your Answer: D **Correct Answer: D** Correct Discuss

Q #16 Numerical Type Award: 1 Penalty: 0 Compiler Design

Consider the following context-free grammar, with start symbol S and terminals $a, ; , <, >$.

$$S \to \ <L \mid a \qquad L \to aR \mid \ <LR \quad R \to \ > \ \mid \ ; L$$

How many different parse trees are there for the string $< < a > ; a > ?$

Your Answer: 1 **Correct Answer: 1** Correct Discuss

Q #17 Numerical Type Award: 1 Penalty: 0 Combinatory

The number of ways that one can divide 10 distinguishable objects into 3 indistinguishable *non-empty* piles, is:

$$\left\{ \begin{array}{c} 10 \\ 3 \end{array} \right\} = 9330$$

In how many different ways can one do this if the piles are also distinguishable?

Your Answer:	Correct Answer: 55980	Not Attempted	Discuss

Q #18 | Numerical Type | Award: 1 | Penalty: 0 | Combinatory

The number of ways that one can divide 10 distinguishable objects in 3 indistinguishable *non-empty* piles, is:

$$\left\{ \begin{array}{c} 10 \\ 3 \end{array} \right\} = 9330$$

In how many different ways can one do this if the objects are also indistinguishable?

Your Answer:	Correct Answer: 8	Not Attempted	Discuss

Q #19 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Set Theory & Algebra

Let $*$ be the binary operation on the rational numbers given by $a * b = a + b + 2ab$. Which of the following are true?

I. $*$ is commutative
II. There is a rational number that is a $* - $ identity.
III. Every rational number has a $* - $ inverse.

A. I only
B. I and II only
C. I and III only
D. I, II, and III

Your Answer: D	Correct Answer: B	Incorrect	Discuss

Q #20 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | CO and Architecture

The clock rate for Machine A is 2.4GHz, and the clock rate for machine B is 3.0GHz. For a particular program, the average CPI on machine A is 1.2. For the same program, the average CPI on machine B is 2.0. Machine A is K times as fast as Machine B, with respect to this program. What is K?

A. 1
B. $4/3$
C. 2
D. $3/4$

Your Answer: D	Correct Answer: B	Incorrect	Discuss

Q #21 | Numerical Type | Award: 1 | Penalty: 0 | Digital Logic |

How many 4-to-1 multiplexers are needed to implement a 64-to-1 multiplexer?

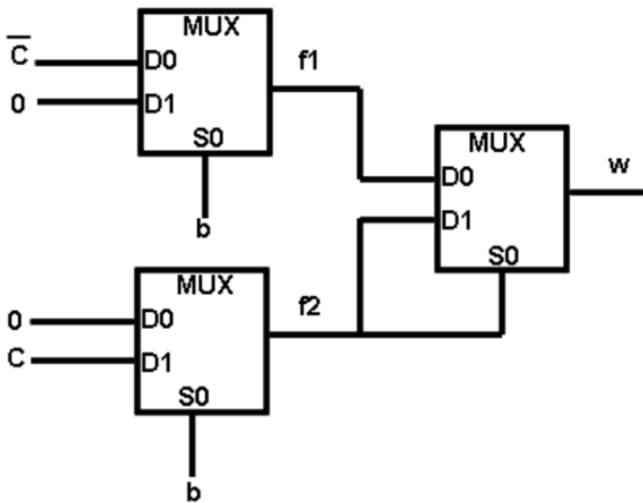
| Your Answer: 21 | Correct Answer: 21 | Correct | Discuss |

Q #22 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Digital Logic |

What is the output for the following circuit?

A. $w = \overline{b}c$

B. $w = b \oplus c$

C. $w = b \oplus \overline{c}$

D. $w = \overline{b} + c$

| Your Answer: C | Correct Answer: C | Correct | Discuss |

Q #23 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Databases |

An attribute A is called prime if A is in any of the candidate keys. Assume in the following statements, A is an attribute & X is a set of attributes.

Consider the following statements:

A. Domain of each attribute is an elementary type; that is, not a set or a record structure.

B. Whenever $X \mapsto A$ is a functional dependency that holds in relation **R** and $A \notin X$, then either
   ○ A is prime, or
   ○ X is a key or a super-key for **R**.

C. Whenever $X \mapsto A$ is a functional dependency that holds in relation **R** and $A \notin X$, then either
   ○ A is prime, or
   ○ X is not a proper subset of any key for **R**.

D. Whenever $X \mapsto A$ is a functional dependency that holds in relation **R** and $A \notin X$, then
   ○ X is a key or a super-key for **R**.

Which of the following is a correct match??

A. A − 1NF, B − 2NF, C − 3NF, D − BCNF
B. A − 1NF, B − BCNF, C − 2NF, D − 3NF
C. A − 1NF, B − 3NF, C − 2NF, D − BCNF
D. A − BCNF, B − 3NF, C − 2NF, D − 1NF

| Your Answer: | Correct Answer: C | Not Attempted | Discuss |

Q #24 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Databases

Assume that a data file has an index consisting of N items, where N is large. If a binary search of the index is used to find an item, then, of the following, which best approximates the mean number of comparisons required to locate a specific index entry?

    A. $(N+1)/2$
    B. $N(N-1)/2$
    C. $\left(\log_2 N\right) - 1$
    D. $N\log_2 N$

| Your Answer: | Correct Answer: C | Not Attempted | Discuss |

Q #25 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Databases

Let $R(a, b)$ be a schema and Q1 and Q2 are queries on R.

```
Q1: SELECT * FROM R;
Q2: (SELECT * FROM R) INTERSECT (SELECT * FROM R);
```

Which of the following statements is true?

    A. Q1 and Q2 produce the same answer.
    B. The answer to Q1 is always contained in the answer to Q2.
    C. The answer to Q2 is always contained in the answer to Q1.
    D. Q1 and Q2 produce different answers.

| Your Answer: A | Correct Answer: C | Incorrect | Discuss |

Q #26 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Programming in C

What will be the output of the following C program?

```
#include<stdio.h>
void main()
{
    int i=6;
    for(--i; --i; i--)
    {
      printf("%d",i);
    }
}
```

    A. 42
    B. 31
    C. Infinite loop
    D. None of these

| Your Answer: A | Correct Answer: A | Correct | Discuss |

Q #27 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Programming in C

Consider the following C program:-

```
#include <stdio.h>
void ubswap(int **a, int **b) {
    int* temp = *a;
    *a = *b;
    *b = temp;
}
int main() {
    int x = 1, y = 9;
    int* u = &x;
    int* v = &y;
    int** a = &u;
    int** b = &v;

    ubswap(a, b);
    return 0;
}
```

Which pair of variables in the main function are swapped immediately after the function call "ubswap(a, b)" and before "return 0"?

    A. x and y
    B. u and v
    C. a and b
    D. None of the above

Your Answer: B | **Correct Answer: B** | Correct | Discuss

Q #28 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

You are given a bit-array $A[1\ldots n]$ (i.e., $A[i] \in \{0, 1\}$ for each i) and told that this is a "0 -to-1" bit-array. This means that for some (unknown) index $1 \leq j < n$, $A[1], \ldots, A[j]$ are all 0 's and $A[j + 1], \ldots, A[n]$ are all 1 's. The index j for such an array is called the transition index. We design a divide-and-conquer algorithm for finding the transition index for a given 0 -to- 1 bit-array. The input to the algorithm is an array A and the size n of the array A.

What will be the worst-case time complexity of the best divide-and-conquer algorithm?

    A. $\Theta(\log n)$
    B. $\Theta(n\log n)$
    C. $\Theta(n)$
    D. $\Theta\left(n^2\right)$

Your Answer: A | **Correct Answer: A** | Correct | Discuss

Q #29 | Numerical Type | Award: 2 | Penalty: 0 | Algorithms

Consider an array that has 10 distinct elements. Suppose we use randomized quicksort (with the pivot chosen uniformly at random). What is the probability that the partition method will result in an array such that the size of the smaller subarray is ≥ 3?

Note: The partition method creates two subarrays, one on the left and one on the right of the chosen pivot. The pivot itself is not part of any subarray.

Your Answer: 0.4 | **Correct Answer: 0.4** | Correct | Discuss

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Q #30   Numerical Type   Award: 2   Penalty: 0   Algorithms

Consider the following pseudocode for a function that operates on an N element array $A[1], A[2], \ldots, A[N]$ of integers.

```
function mystery (A[1...N])
{
    int i,j,position,tmp;
    for i=1 to N
    {
        position=i;
        for j=i+1 to N
        {
            if(A[j]<A[position])
            {
                position=j;
            }
        }
        tmp=A[i];
        A[i]=A[position];
        A[position]=tmp;
    }
}
```

If $N = 100$, how many times is the comparison $A[j] < A[position]$ checked?

Your Answer: 4950   **Correct Answer: 4950**   Correct   Discuss

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Q #31   Numerical Type   Award: 2   Penalty: 0   DS

How many binary trees with 3 nodes, $A, B,$ and C when traversed in post-order will give the sequence A, B, C? (It is NOT a search tree)

Your Answer: 5   **Correct Answer: 5**   Correct   Discuss

Q #32   Numerical Type   Award: 2   Penalty: 0   DS

The in-order traversal of a binary tree is $HFIEJGZ,$ and the post-order traversal of the same tree is $HIFJZGE.$ What will be the total number of nodes in the left sub-tree of the given tree? (It is NOT a search tree)

Your Answer: 3   **Correct Answer: 3**   Correct   Discuss

Q #33   Multiple Select Type   Award: 2   Penalty: 0   Compiler Design

Consider the following grammar:

$$S \rightarrow aS'$$
$$S' \rightarrow bS' \mid \epsilon$$

Which of the following is/are CORRECT right sentential form of the given grammar?

A. abS'
B. bS'
C. $aS'b$
D. bbS

| Your Answer: A | Correct Answer: A | Correct | Discuss |

Q #34 Multiple Choice Type Award: 2 Penalty: 0.67 Compiler Design

$$S \rightarrow S1\ T$$
$$S1 \rightarrow a\ |\ (SS)$$
$$T \rightarrow \varepsilon\ |\ b\ T$$

In the LL(1) parser table, M, of the grammar the entries $M[S1, a]$ and $M[T, a]$ respectively are -

A. $\{S1 \rightarrow a\}$ and $\{T \rightarrow bT\}$
B. $\{S1 \rightarrow (SS)\}$ and $\{T \rightarrow bT\}$
C. $\{S1 \rightarrow (SS)\}$ and $\{T \rightarrow \varepsilon\}$
D. $\{S1 \rightarrow a\}$ and $\{T \rightarrow \varepsilon\}$

| Your Answer: D | Correct Answer: D | Correct | Discuss |

Q #35 Multiple Choice Type Award: 2 Penalty: 0.67 Computer Networks

Consider two TCP connections A and B:

The RTT for connection A is 100 ms while the RTT for connection B is 200 ms. Let ssthresh denote the threshold at which the congestion window size evolution switches over from the Slow Start phase to the Congestion Avoidance phase. Both connections have the ssthresh value of 8.

At time T seconds, both connections have just had a timeout, and so their window size is set to 1. Calculate how many packets each connection is able to send in the next 1 second (including at time $T + 1$ seconds). Assume that each packet can be transmitted in 0 time, and that there are no dropped packets for either connection during the interval $[T, T + 1]$ seconds.

Which of the following options is TRUE?

A. Connection A will end up sending 55 more packets than connection B in interval $[T, T + 1]$ seconds.
B. Connection B will end up sending 55 more packets than connection A in interval $[T, T + 1]$ seconds.
C. Connection A will end up sending 65 more packets than connection B in interval $[T, T + 1]$ seconds.
D. Connection B will end up sending 65 more packets than connection A in interval $[T, T + 1]$ seconds.

| Your Answer: | Correct Answer: C | Not Attempted | Discuss |

Q #36 Multiple Select Type Award: 2 Penalty: 0 Probability

Let A, B, C be events such that $P(A) = P(B) = P(C) = 0.5$, $P(A \cap B) = 0.3$, $P(A \cap C) = 0$.

Which of the following is/are true?

A. $P(A \cup B) = 0.75$
B. $P(A \cup C) = 1$
C. $P(B \cap C) = 0.23$
D. $P(B \cup C) = 0.9$

| Your Answer: B | Correct Answer: B | Correct | Discuss |

Q #37 Multiple Select Type   Award: 2   Penalty: 0   Calculus

Which of the following is/are TRUE?

A. There is a differentiable function $f(x)$ with the property that $f(1) = -2$ and $f(5) = 14$ and $f'(x) < 3$ for every real number x.
B. There exists a function f such that $f(1) = -2, f(3) = 0$, and $f'(x) > 1$ for all x.
C. For all functions f, if $a < b, f(a) < 0, f(b) > 0$, then there must be a number c, with $a < c < b$ and $f(c) = 0$.
D. If f is differentiable at the number x, then it is continuous at x.

Your Answer: D   Correct Answer: D   Correct   Discuss

Q #38 Numerical Type   Award: 2   Penalty: 0   Operating System

Consider the following jobs along with their arrival and execution time.

Job	Arrival time	Execution time
A	0	45
B	19	15
C	40	30
D	79	50
E	89	30

What is the average turnaround time for these processes with the preemptive shortest remaining processing time first (SRPT) algorithm?

Your Answer: 41   Correct Answer: 49.4   Incorrect   Discuss

Q #39 Multiple Choice Type   Award: 2   Penalty: 0.67   Computer Networks

Consider a TCP flow sending three segments, namely $1, 2,$ and 3. Due to congestion, the TCP flow experiences exactly two losses. Only segments can be lost; acknowledgments are not lost.

Segments 1 and 3 are lost in their first transmission. TCP detects packet loss either through timeout or three duplicate ACKs. Let the initial congestion window size be $1,$ and the receiver sends an acknowledgment for each packet upon successful receipt.

The transmission time of a segment is negligible, and the round-trip time is RTT. The re-transmission timeout (RTO) is twice the RTT, i.e., RTO = 2 * RTT.

How much time (in RTT) will it take for the TCP sender to receive acknowledgments for all packets successfully?

A. 3 RTTs
B. 5 RTTs
C. 6 RTTs
D. 8 RTTs

Your Answer: Correct Answer: C   Not Attempted   Discuss
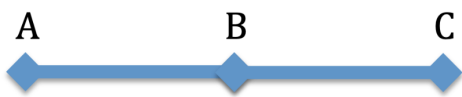
Q #40 Multiple Choice Type   Award: 2   Penalty: 0.67   Computer Networks

Consider a network with two links.

Node A is trying to send packets to node C.

A   B   C

Let $p1$ be the probability of failure on the first link (A-B), and $p2$ be the probability of failure on the second link (B-C).

Assume failures are detected by the ends (i.e., A finds out that the packet did not reach C, and resends). On average, how many transmissions from A are needed before the packet arrives at the destination C?

A. $\dfrac{p_1 p_2}{\left(1 - p_2\right)\left(1 - p_1\right)}$

B. $\dfrac{1}{p1 + (1 - p1)p2}$

C. $\dfrac{p_1}{1 - p_1} + \dfrac{p_2}{1 - p_2}$

D. $\dfrac{1}{\left(1 - p_1\right)\left(1 - p_2\right)}$

Your Answer: **Correct Answer: D**   Not Attempted   Discuss

Q #41   Multiple Choice Type   Award: 2   Penalty: 0.67   Operating System

Assume the following code is compiled and run on a modern Linux machine.

Assuming $\mathrm{fork}()$ never fails, how many times will the message "Hello" will be displayed?

```c
#include <stdio.h>
#include <unistd.h>
int main() {
    int a = 0;
    int rc = fork();
    if (rc == 0) {
        rc = fork();
    } else {
        printf("Hello");
    }
    printf("Hello");
    return 0;
}
```

A. 2
B. 3
C. 4
D. 6

Your Answer: B   **Correct Answer: C**   Incorrect   Discuss

Q #42   Multiple Select Type   Award: 2   Penalty: 0   Theory of Computation

Consider the following context-free language: $L_1 = \left\{a^m b^n c^n \mid n, m \geq 0\right\}$. Which of the following choices of language L_2 is context-free and ensures that $L_1 \cap L_2$ is not a context-free language?

A. $L_2 = \left\{ a^k b^{2k} c^m \mid k \geq 0 \text{ and } m \geq 0 \right\}$

B. $L_2 = \left\{ (abc)^k \mid k \geq 0 \right\}$

C. $L_2 = \left\{ a^k b^m c^k \mid k \geq 0 \text{ and } m \geq 0 \right\}$

D. $L_2 = \left\{ a^k b^{2k} c^{2k} \mid k \geq 0 \right\}$

| Your Answer: A;C;D | Correct Answer: A;C | Incorrect | Discuss |

Q #43 | Multiple Select Type | Award: 2 | Penalty: 0 | Theory of Computation

Let D be a DFA with n states & N be an NFA with n states. Which of the following is/are true?

A. If D accepts some string of length n, then the language of D is infinite.
B. If D accepts some string of length $n - 1$, then the language of D is infinite.
C. If N accepts some string of length n, then the language of N is infinite.
D. If N accepts some string of length $n - 1$, then the language of N is infinite.

| Your Answer: | Correct Answer: A;B;C | Not Attempted | Discuss |

Q #44 | Multiple Select Type | Award: 2 | Penalty: 0 | Theory of Computation
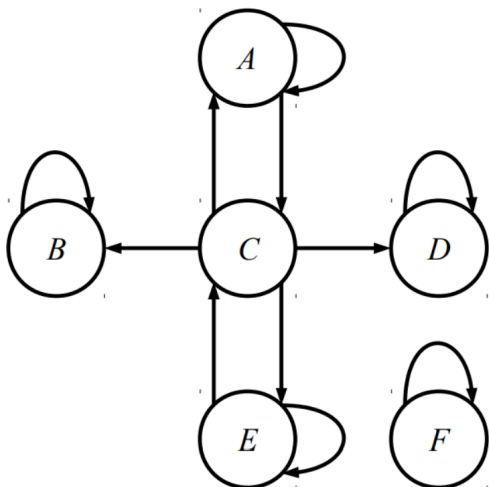
Which of the following statements is/are false?

A. Let A and B be sets of languages over some fixed alphabet Σ, with A $\subseteq$ B. If A is closed under some operation P, then B is also closed under P.

B. Let A and B be sets of languages over some fixed alphabet Σ, with A $\subseteq$ B. If B is closed under some operation P, then A is also closed under P.

C. For all sets A, B, if A and B are both nonregular then A $\cap$ B is also nonregular.

D. The set of decidable languages over some fixed alphabet Σ is closed under the operation of taking subsets (that is, if L1 is decidable and L2 $\subseteq$ L1, then L2 is decidable.)

| Your Answer: A;B;D | Correct Answer: A;B;C;D | Incorrect | Discuss |

Q #45 | Multiple Select Type | Award: 2 | Penalty: 0 | Mathematical Logic

Below is a drawing(graph representation) of a binary relation R over a set P of elements {A, B, C, D, E, F} :


Which of the following first-order logic statements about R, is/are true?

A. $\forall x \in P. (xRx \rightarrow \exists y \in P. xRy)$
B. $\exists x \in P. \forall y \in P. xRy$
C. $\exists x \in P. (xRx \rightarrow \forall y \in P. xRy)$
D. $\forall x \in P. \exists y \in P. xRy$

Your Answer: | **Correct Answer: A;C;D** | Not Attempted | Discuss

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Q #46 | Numerical Type | Award: 2 | Penalty: 0 | Graph Theory

Assume the following graph is a labeled graph i.e. every vertex has a unique label.

In how many ways can we color the following labeled graph G with six colors $\{R, G, B, W, Y, M\}$ such that no two adjacent vertices are assigned the same color?
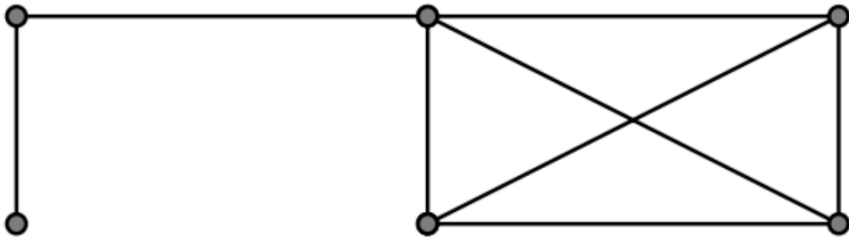
Your Answer: 1842 | **Correct Answer: 9000** | Incorrect | Discuss

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Q #47 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

An involution is a function $f: A \rightarrow A$ where $f(f(x)) = x$.

A fixed point of any function $f: A \rightarrow A$ is an element $x \in A$ for which $f(x) = x$.

Which of the following statement(s) must be true for any involution $f: A \rightarrow A$?

A. The number of fixed points of an involution f is even if the number of elements in A is odd.
B. The number of fixed points of an involution f is even if the number of elements in A is even.
C. Every bijective function $f: A \rightarrow A$ is an involution.
D. Every involution $f: A \rightarrow A$ is a bijective function.

Your Answer: B;D | **Correct Answer: B;D** | Correct | Discuss

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Q #48 | Numerical Type | Award: 2 | Penalty: 0 | CO and Architecture

Consider a processor with a branch-if-equal instruction that is 32 bits long: BEQ R12, R11, X. 6 bits are used to encode the opcode, 6 bits are used to encode one register number, 6 bits are used to encode another register number & 14 bits are used to encode an unsigned offset that will be added to the program counter (PC) if the branch ends up being taken, and a new instruction address is required. The branch instruction is at memory location 5004 (in decimal). All instructions are 4 bytes long. How many instructions away (the number of instructions) from the BEQ instruction could we reach?

Your Answer: 4096 | **Correct Answer: 4096** | Correct | Discuss

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Q #49 | Numerical Type | Award: 2 | Penalty: 0 | CO and Architecture

Consider the following code fragment:

```
I1:     LD      R1, 0(R2)        ; Load R1 = Memory(R2)
I2:     DADDI   R1, R1, 1        ; R1 = R1 + 1
I3:     SD      R1, 0(R2)        ; Store Memory(R2) = R1
I4:     DADDI   R2, R2, 8        ; R2 = R2 + 8
I5:     DADDI   R4, R4, -1       ; R4 = R4 - 1
I6:     BNE     R4, R0, I1       ; Branch if R4 != 0
```

Identify all data dependencies (potential data hazards) in the given code snippet within one loop iteration. Let the number of true data dependencies be X, the number of anti-dependencies be Y, & the number of output dependencies be Z.

What is $X + 2Y + 3Z$?

Your Answer: 11   Correct Answer: 10   Incorrect   Discuss

Q #50   Multiple Select Type   Award: 2   Penalty: 0   CO and Architecture

A computer has a 32-bit address bus with a direct mapped cache, using 4 bits for block offset, 16 tag bits, and 12 index bits.

Which of the following address pairs can be placed in the cache simultaneously?

A. 3AC6 F45 6 and 26A3 545 6
B. 3F08 C30 4 and 3F08 C37 1
C. 5E3C 768 0 and 8F3C 768 A
D. 2233 445 5 and 2233 445 C

Your Answer: A;B;C   Correct Answer: A;B;D   Incorrect   Discuss

Q #51   Multiple Choice Type   Award: 2   Penalty: 0.67   Digital Logic

We would like to use a T flip-flop and design a circuit that works like a J-K flip-flop. The simplified input to the T flip-flop should be:

A. $T = J = K$

B. $T = JQ' + K'Q$

C. $T = JQ' + KQ$

D. $T = JQ + KQ'$

Your Answer: C   Correct Answer: C   Correct   Discuss
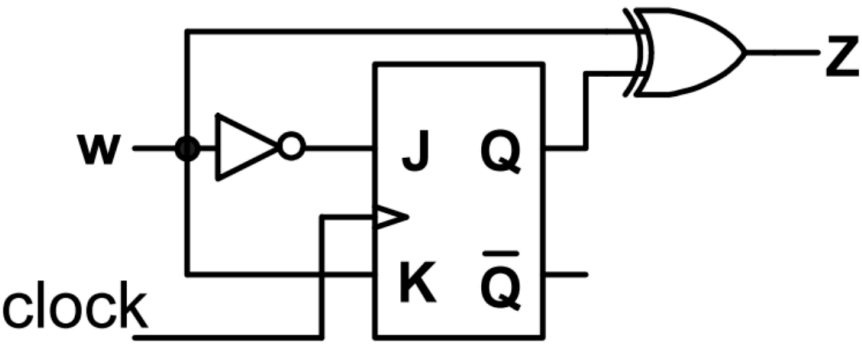
Q #52   Multiple Choice Type   Award: 2   Penalty: 0.67   Digital Logic

Consider the sequential circuit shown below.

Consider the following state assignment: A stands for $Q = 0$, B stands for $Q = 1$. The state transition diagram for the circuit above is shown in:

A. a

B. b

C. c

D. d

Your Answer: **Correct Answer: X**   Not Attempted   Discuss

Q #53   Multiple Select Type   Award: 2   Penalty: 0   Digital Logic

Consider the following 4-bit adder circuit.

Note, C_0 is carry in and C_4 is carry out for the 4-bit adder. The given circuit operates on 2's complement numbers.

In the given circuit, overflow occurs for:

A. $A_3A_2A_1A_0 = 0111$, $B_3B_2B_1B_0 = 1000$ and S = 0

B. $A_3A_2A_1A0 = 1100$, $B_3B_2B_1B_0 = 1010$ and S = 0

C. $A_3A_2A_1A0 = 0111$, $B_3B_2B_1B_0 = 1001$ and S = 1

D. $A_3A_2A_1A0 = 0101$, $B_3B_2B_1B_0 = 1110$ and S = 1

Your Answer: | **Correct Answer: B;C** | Not Attempted | Discuss

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Q #54 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

Of the following, which gives the best upper bound for the value of $f(N)$ where f is a solution to the recurrence

$$f(2N + 1) = f(2N) = f(N) + \log N \text{ for } N \geq 1,$$

with $f(1) = 0$?

A. $O(\log N)$

B. $O(N \log N)$

C. $O\left((\log N)^2\right)$

D. $O(N)$

Your Answer: C | **Correct Answer: C** | Correct | Discuss

Q #55 | Numerical Type | Award: 2 | Penalty: 0 | Databases

Consider the following partial schedule for several data items for transactions T_i with timestamp i:

How many transactions are Aborted by the timestamp scheduler?

Your Answer: | **Correct Answer: 2** | Not Attempted | Discuss

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You're doing good, you can target above 70 percentage!