

Summary in Graph

Exam Summary (GO Classes Test Series 2024 | Mock GATE | Test 13).

Qs. Attempted:	54 27 + 27	Correct Marks:	55 17 + 38
Correct Attempts:	36 17 + 19	Penalty Marks:	7.33 2.67 + 4.67
Incorrect Attempts:	18 10 + 8	Resultant Marks:	47.66 14.33 + 33.33

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

A total of n points are equally spaced around a circle and are labelled with the integers 1 to n , in order. Two points are called diametrically opposite if the line segment joining them is a diameter of the circle. If the points labelled 7 and 35 are diametrically opposite, then n equals

- A. 54
- B. 55
- C. 56
- D. 57

Your Answer: C

Correct Answer: C

Correct

Discuss

Q #2

Multiple Choice Type

Award: 1

Penalty: 0.33

Quantitative Aptitude

In a factory, Erika assembles 3 calculators in the same amount of time that Nick assembles 2 calculators. Also, Nick assembles 1 calculator in the same amount of time that Sam assembles 3 calculators. How many calculators in total can be assembled by Nick, Erika, and Sam in the same amount of time as Erika assembles 9 calculators?

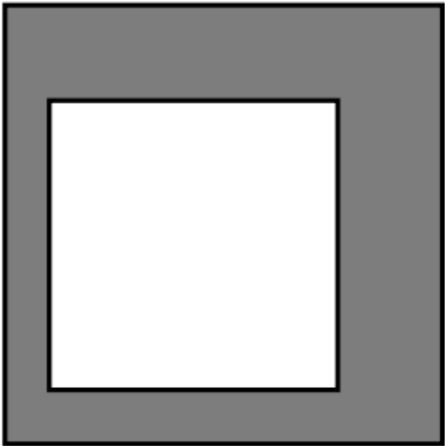
Processing math: 100%

- A. 30
- B. 24
- C. 27
- D. 33

Your Answer: D Correct Answer: D Correct Discuss

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

A small square is drawn inside a larger square as shown. The area of the shaded region and the area of the unshaded region are each 18 cm^2 . What is the side length of the larger square?



- A. 3
- B. 4
- C. 6
- D. 9

Your Answer: C Correct Answer: C Correct Discuss

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

Chris received a mark of 50% on a recent test. Chris answered 13 of the first 20 questions correctly. Chris also answered 25% of the remaining questions on the test correctly. If each question on the test was worth one mark, how many questions in total were on the test?

- A. 23
- B. 38
- C. 32
- D. 24

Your Answer: C Correct Answer: C Correct Discuss

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

She _____ the book from the library yesterday.

- A. borrowed
- B. lent
- C. bought
- D. gave

Your Answer: B Correct Answer: A Incorrect Discuss

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

A positive integer n is a multiple of 7. The square root of n is between 17 and 18. How many possible values of n are there?

- A. 2
- B. 3
- C. 4
- D. 5

Your Answer: D Correct Answer: D Correct Discuss

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

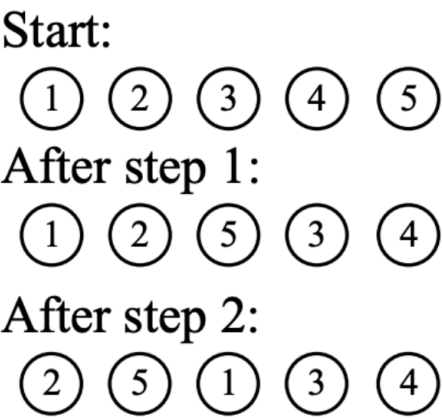
Ben participates in a prize draw. He receives one prize that is equally likely to be worth \$5, \$10 or \$20. Jamie participates in a different prize draw. She receives one prize that is equally likely to be worth \$30 or \$40. What is the probability that the total value of their prizes is exactly \$50?

- A. $\frac{1}{6}$
- B. $\frac{1}{3}$
- C. $\frac{1}{2}$
- D. $\frac{1}{4}$

Your Answer: B Correct Answer: B Correct Discuss

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

Five balls, numbered 1 to 5, are placed in order on a table. A sequence of steps is performed on the balls. In step 1, the rightmost ball is picked up and put in the middle of the four remaining balls. (The remaining balls are shifted to make room for the inserted ball.) Then in step 2, the leftmost ball is picked up and put in the middle of the four remaining balls. These steps repeat, with the rightmost and leftmost balls alternately picked up and put in the middle of the four remaining balls. Immediately after step N , the balls are in the reverse of their original order. Which of the following is a possible value of N ?



- A. 2023
- B. 2024
- C. 2025
- D. 2026

Your Answer: C Correct Answer: C Correct Discuss

Processing math: 100%

Q #9

Multiple Choice Type

Award: 2

Penalty: 0.67

Analytical Aptitude

Reading from left to right, the sequence consists of 6 X's, followed by 24 Y's, followed by 96 X's. Hence, there are a total of 126 letters in the sequence.

After the first n letters, reading from left to right, one letter has occurred twice as many times as the other letter.

There are multiple possible values of n . Which of the following is one of the possible values of n ?

- A. 72
- B. 74
- C. 76
- D. 80

Your Answer: A

Correct Answer: A

Correct

Discuss

Q #10

Multiple Choice Type

Award: 2

Penalty: 0.67

Verbal Aptitude

The significance of the Magna Carta lies not in its _____ provisions, but in its broader impact: it made the king subject to the law.

- A. specific
- B. revolutionary
- C. implicit
- D. controversial

Your Answer:

Correct Answer: A

Not Attempted

Discuss

Technical

Q #1

Multiple Choice Type

Award: 1

Penalty: 0.33

Calculus

Let $f(x)$ be a real-valued function all of whose derivatives exist. Recall that a point x_0 in the domain is called an inflection point of $f(x)$ if the second derivative $f''(x)$ changes sign at x_0 . Given the function

$f(x) = \frac{x^5}{20} - \frac{x^4}{2} + 3x + 1$, which of the following statement is true?

- A. $x_0 = 0$ is not an inflection point.
- B. $x_0 = 6$ is the only inflection point.
- C. $x_0 = 0$ and $x_0 = 6$, both are inflection points.
- D. The function does not have an inflection point.

Your Answer: A

Correct Answer: B

Incorrect

Discuss

Q #2

Multiple Choice Type

Award: 1

Penalty: 0.33

Probability

Let x be a random variable possessing the probability density function

$$f(x) = \begin{cases} cx & , x \in [0, 10] \\ 0 & , \text{otherwise} \end{cases}$$

where $c \in \mathbb{R}$. The probability that $x \in [1, 2]$ is ____.

- A. $\frac{1}{100}$
- B. $\frac{3}{100}$
- C. $\frac{5}{100}$
- D. $\frac{7}{100}$

Your Answer: B Correct Answer: B Correct Discuss

Q #3 Multiple Choice Type Award: 1 Penalty: 0.33 Linear Algebra

If A is a 3×3 matrix such that $A \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ and $A \begin{pmatrix} 3 \\ 4 \\ 5 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$, then the product $A \begin{pmatrix} 6 \\ 7 \\ 8 \end{pmatrix}$ is ____.

- A. $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$
- B. $\begin{pmatrix} -1 \\ 2 \\ 0 \end{pmatrix}$
- C. $\begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}$
- D. $\begin{pmatrix} 9 \\ 10 \\ 11 \end{pmatrix}$

Your Answer: B Correct Answer: B Correct Discuss

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

Given that $f(n) = O(g(n))$ (where O is Big- O) and $f(n) = \Omega(g(n))$, which of the following statement is always true?

- A. $f(n) = o(g(n))$ (here o is small- o).
- B. $f(n) = \theta(g(n))$.
- C. $f(n) = \omega(g(n))$.
- D. Both A and B are always true.

Processing math: 100% Your Answer: D Correct Answer: B Incorrect Discuss

Q #5

Multiple Choice Type

Award: 1

Penalty: 0.33

Algorithms

Professor Fiorina uses the following algorithm to merge k sorted lists, each containing n/k elements.

She takes the first list and merges it with the second list using a linear-time algorithm for merging two sorted lists (If there are two lists, the linear-time algorithm merges both at a cost of $\theta(p + q)$ where p and q are the sizes of the lists). Then, she merges the resulting list of $2n/k$ elements with the third list, merges the list of $3n/k$ elements that results with the fourth list, and so forth, until she ends up with a single sorted list of all elements.

What is the worst-case running time of the professor's algorithm in terms of n and k ?

- A. $\theta(n)$
- B. $\theta(nk)$
- C. $\theta(n\log k)$
- D. $\theta(k\log n)$

Your Answer: B

Correct Answer: B

Correct

Discuss

Q #6

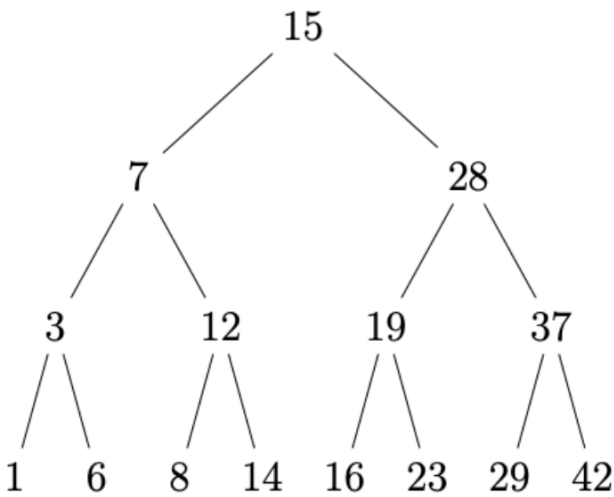
Multiple Choice Type

Award: 1

Penalty: 0.33

DS

Suppose we constructed the binary search tree shown by starting with an empty tree and inserting one element at a time from an input sequence, without any rotations or other manipulations. Which of the following assertions about the order of elements in the input sequence can NOT be true?



- A. 8 came after 3 and 19 came after 29.
- B. 7 came before 8 and 23 came after 37.
- C. 1 came after 12 and 29 came before 42.
- D. 3 came before 14 and 16 came before 28.

Your Answer: D

Correct Answer: D

Correct

Discuss

Q #7

Numerical Type

Award: 1

Penalty: 0

DS

Suppose that a binary min-heap stores six elements with priorities 10, 20, 30, 40, 50, and 60 in its array A. What is the largest of these items that could be stored in $A[2]$? (indexing starts from zero)

Your Answer: 50

Correct Answer: 50

Correct

Discuss

Q #8

Multiple Choice Type

Award: 1

Penalty: 0.33

Programming in C

Processing math: 100%

what will be output printed by the following program?

```
#include<stdio.h>
main()
{
    int c=4;
5.    switch(c)
    {
        c=c-1;

        case 4:
10.        printf("IITB ");
        break;
        default:
            printf("IISc ");
        case 3:
15.        printf("IITM ");
        case 2 :
            printf("IITD");
    }
}
```

- A. IITB IITM
- B. IITB IISc IITM
- C. IITB
- D. IITB IITM IITD

Your Answer: C

Correct Answer: C

Correct

Discuss

Q #9

Multiple Choice Type

Award: 1

Penalty: 0.33

Programming in C

What will be the output of the following program?

```
#include <stdio.h>

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

10.    return 0;
}
```

- A. 1
- B. 2
- C. 3
- D. 4

Your Answer: B

Correct Answer: B

Correct

Discuss

Q #10

Multiple Choice Type

Award: 1

Penalty: 0.33

Operating System

Suppose we have a multi-level index file system, and this file system has 512 Bytes blocks, inodes with 3 direct, 1 single-indirect, 2 double-indirect, and 1 triple-indirect pointer, and 64-bit block identifiers.

At a minimum size, how large does a file need to be before the relevant inode requires the first single-indirect block number be used?

- A. 1536 Bytes
- B. 1537 Bytes
- C. 512 Bytes

Processing math: 100%

D. 1500 Bytes

Your Answer: A

Correct Answer: B

Incorrect

Discuss

Q #11

Multiple Choice Type

Award: 1

Penalty: 0.33

Operating System

Consider a virtual memory system that uses paging. Virtual and physical addresses are both 32 bits long, and the page size is $4\text{KB} = 2^{12}$ bytes. A process P_1 has the following page table. Frame numbers are given in hexadecimal notation (recall that each hexadecimal digit represents 4 bits).

	Frame Number
0	0x0014e
1	0x03b65
2	0x00351
3	0x00875
4	0x06a3f

What will be the physical address for the virtual address: 0x00003b65?

- A. 0x00003b65
- B. 0x00875b65
- C. 0x00875
- D. Translation is not possible as per the given page table

Your Answer: C

Correct Answer: B

Incorrect

Discuss

Q #12

Multiple Choice Type

Award: 1

Penalty: 0.33

Computer Networks

An IP router implementing Classless Inter-domain Routing (CIDR) receives a packet with address 128.96.39.10. The router's routing table has the following entries:

Subnet Number	Output Interface Identifier
128.96.39.0/25	R2
128.96.39.0/27	R3
128.96.40.0/25	R4
192.4.153.0/26	R5
(default)	R6

The identifier of the output interface on which this packet will be forwarded is _____.

- A. R2
- B. R3
- C. R4
- D. R6

Your Answer:

Correct Answer: B

Not Attempted

Discuss

Q #13

Numerical Type

Award: 1

Penalty: 0

Theory of Computation

Which of the following statements is/are false?

A. If a context-free grammar G is in Chomsky's normal form, then G is not ambiguous.

Processing math: 100%

B. For every number n , the language $L_n = \{0^n1^n\}$ is regular.

- C. If L^* is regular then L is regular.
- D. If there's a 10-state NFA that accepts L then there's a 100-state DFA that accepts L .

Your Answer: B Correct Answer: a;c:d Correct Discuss

Q #14 Numerical Type Award: 1 Penalty: 0 Theory of Computation

Let M be a 8-state Deterministic Finite Automaton over the alphabet $\{a, b, c\}$. If the language accepted by M i.e. $L(M)$ is finite, then the maximum possible cardinality of $L(M)$ is _____.

Your Answer: 1092 Correct Answer: 1093 Incorrect Discuss

Q #15 Multiple Select Type Award: 1 Penalty: 0 Digital Logic

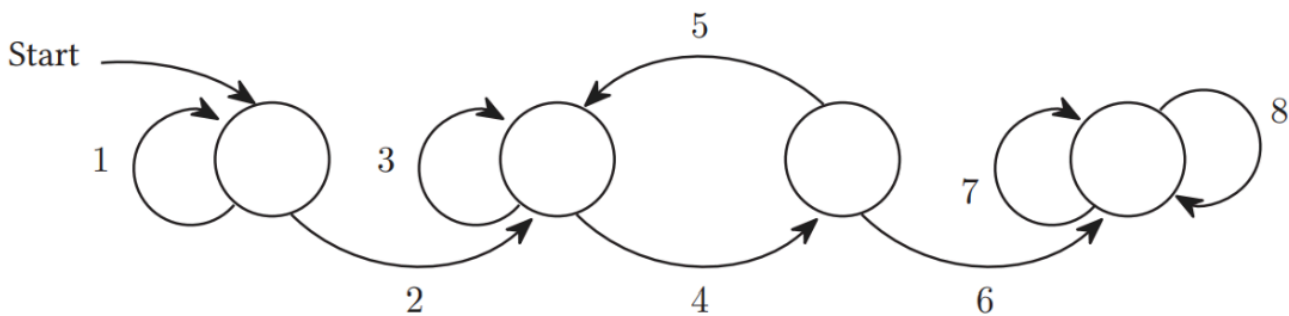
A garage door opens if it ever sees the password 011 in a transmission. More formally, this FSM takes a bitstring consisting of 0's and 1's as its input, and continually outputs 0's until it sees the substring 011, after which it outputs 1's continuously. Example executions of this FSM are below:

Input: 010101001100001010101

Output: 000000000111111111111

Input: 000000000001000000010

Output: 000000000000000000000



For each of the numbered arrows, which of the following marks the correct FSM state transition?

- A. Arrow 1 – (0/0)
- B. Arrow 3 – (1/0)
- C. Arrow 4 – (1/0)
- D. Arrow 5 – (1/1)

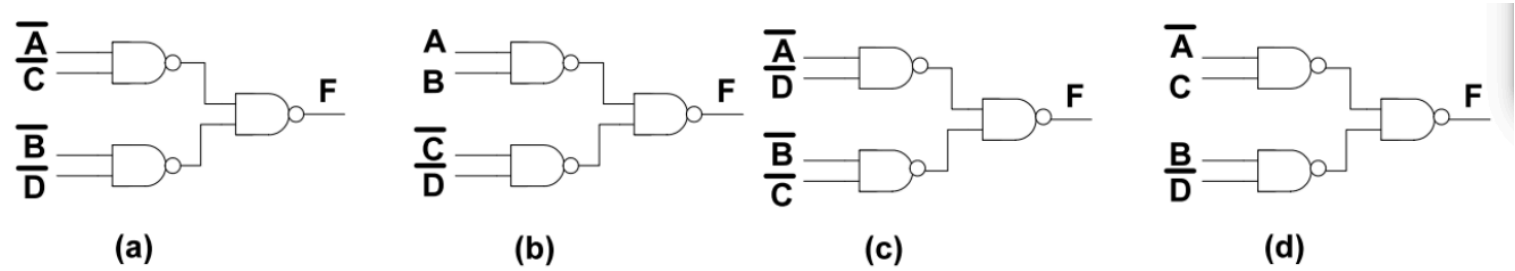
Your Answer: C Correct Answer: C Correct Discuss

Q #16 Multiple Choice Type Award: 1 Penalty: 0.33 Digital Logic

The figure below represents the Karnaugh map for a function $F(A,B,C,D)$. Note, 'X' stands for don't care.

		A B			
		0 0	0 1	1 1	1 0
C D	0 0	1	X	0	X
	0 1	X	1	X	0
	1 1	0	X	0	X
	1 0	X	0	X	1

The simplified logical expression in the sum-of-products (SOP) form (i.e., the minimum number of product terms and the minimum number of literals in every product term) for $F(A,B,C,D)$ can be converted into a circuit implementation using only NAND gates, which is shown in:

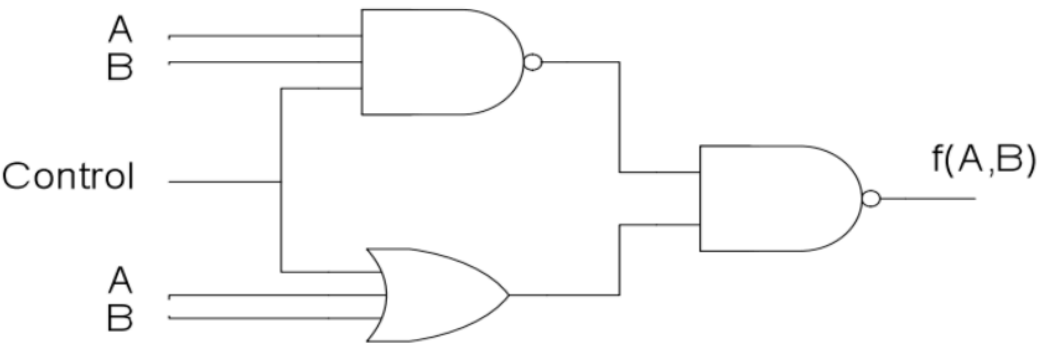


- A. a
- B. b
- C. c
- D. d

Your Answer: A Correct Answer: A Correct Discuss

Q #17 Multiple Select Type Award: 1 Penalty: 0 Digital Logic

What statement is correct for $f(A, B)$ in the following circuit?



- A. $f(A, B) = A \cdot B \cdot (A + B)$ when Control = 1
- B. $f(A, B) = \overline{A} \cdot \overline{B}$ when Control = 0
- C. $f(A, B) = \overline{A} + \overline{B}$ when Control = 1
- D. $f(A, B) = A \cdot B$ when Control = 0

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

Q #18 Multiple Choice Type Award: 1 Penalty: 0.33 Set Theory & Algebra

A group G in which $(ab)^2 = a^2b^2$ for all a, b in G is necessarily

- A. finite
- B. cyclic
- C. abelian
- D. none of the above

Your Answer: C Correct Answer: C Correct Discuss

Q #19 Multiple Choice Type Award: 1 Penalty: 0.33 Digital Logic

Processing math: 100% Two's complement, what is the minimum number of bits needed to represent the numbers -1 and the number 1 respectively?

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

Your Answer: B

Correct Answer: A

Incorrect

Discuss

Q #20

Multiple Choice Type

Award: 1

Penalty: 0.33

Combinatory

A university's mathematics department has 10 professors and will offer 20 different courses next semester. Each professor will be assigned to teach exactly 2 of the courses, and each course will have exactly one professor assigned to teach it. If any professor can be assigned to teach any course, how many different complete assignments of the 10 professors to the 20 courses are possible?

- A. $\frac{20!}{2^{10}}$
- B. $\frac{10!}{2^9}$
- C. $10^{20} - 2^{10}$
- D. $\frac{20!10!}{2^{10}}$

Your Answer: A

Correct Answer: A

Correct

Discuss

Q #21

Multiple Choice Type

Award: 1

Penalty: 0.33

Databases

Let R_1, R_2, \dots, R_n be a decomposition of schema U . Let $u(U)$ be a relation, and let $r_i = \Pi_{R_i}(u)$

Which of the following is true?

- A. $u \subseteq r_1 \bowtie r_2 \bowtie r_3 \bowtie r_4 \bowtie \dots r_n$
- B. $u \supseteq r_1 \bowtie r_2 \bowtie r_3 \bowtie r_4 \bowtie \dots r_n$
- C. $u = r_1 \bowtie r_2 \bowtie r_3 \bowtie r_4 \bowtie \dots r_n$
- D. None of the above

Your Answer: C

Correct Answer: A

Incorrect

Discuss

Q #22

Numerical Type

Award: 1

Penalty: 0

Databases

The order of a leaf node in a B tree is the maximum number of (value, data record pointer) pairs it can hold. Given that the block size is 1 K bytes, data record pointer is 7 bytes long, the value field is 9 bytes long and a block pointer is 6 bytes long, what is the order of the leaf node?

Your Answer:

Correct Answer: 46

Not Attempted

Discuss

Q #23

Multiple Choice Type

Award: 1

Penalty: 0.33

Databases

Processing math: 100%

Consider the following two schedules consisting to two transaction T_1 and T_2 :

$S_1: r_1(A) \ w_1(A) \ r_2(A) \ w_2(A) \ r_1(B) \ w_1(B) \ r_2(B) \ w_2(B)$

$S_2: r_1(A) \ w_1(A) \ r_2(A) \ r_1(B) \ w_2(A) \ w_1(B) \ r_2(B) \ w_2(B)$

Which of the following is/are true about these schedules?

- A. Both S_1 and S_2 are Conflict serializable but not conflict equivalent to each other.
- B. S_1 and S_2 are conflict equivalent but not conflict serializable.
- C. S_1 and S_2 are conflict equivalent and also conflict serializable.
- D. S_1 and S_2 are neither conflict equivalent nor conflict serializable.

Your Answer: Correct Answer: C Not Attempted Discuss

Q #24 Multiple Choice Type Award: 1 Penalty: 0.33 CO and Architecture

In typical RISC ISA, delayed branch executes which instruction irrespective of whether the branch condition is true or false?

- A. Instruction immediately following the branch condition
- B. Instruction immediately preceding the branch condition
- C. Instruction that belongs to a different a subroutine
- D. It waits till the branch condition is evaluated

Your Answer: C Correct Answer: A Incorrect Discuss

Q #25 Numerical Type Award: 1 Penalty: 0 CO and Architecture

Consider a processor with an in-order five-stage pipeline (IF, ID, EX, MEM, and WB) with clock cycle time 10 ns . This processor is executing a program in which 30% of the instructions are conditional branch instructions, 10% of the instructions are unconditional branch instructions. 40% of the conditional branches are taken. Branch target is available at the end of 2nd stage for unconditional branches and at the end of 3rd stage for conditional branches. Assume that the instruction following the branch is always started and ignored if the branch is taken. What is the throughput (Million instructions per second) of the system?

Your Answer: 74.63 Correct Answer: 74.01:75.01 Correct Discuss

Q #26 Multiple Choice Type Award: 2 Penalty: 0.67 DS

Let T be the smallest AVL tree of height h . How many nodes does it have, if the smallest AVL tree of height $h - 2$ has m nodes and the smallest AVL tree of height $h - 3$ has k nodes?

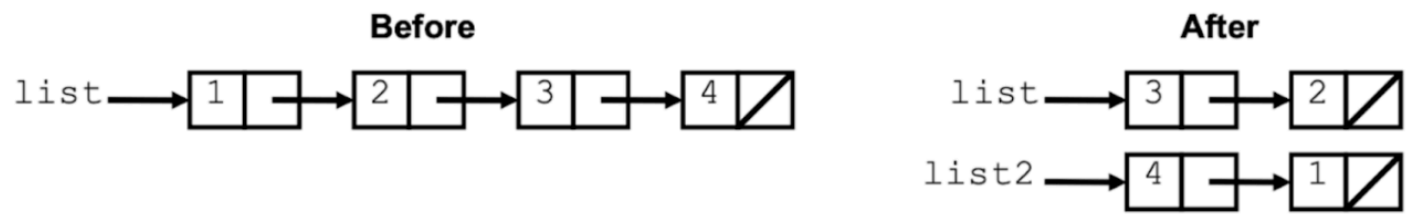
- A. $m + k + 2$
- B. $m + 2k$
- C. $2m + k$
- D. $2m + k + 2$

Your Answer: D Correct Answer: D Correct Discuss

Q #27 Multiple Choice Type Award: 2 Penalty: 0.67 DS

Processing math: 100%

Consider the null-terminated linked list of four integers 1->2->3->4->NULL, and the variable 'list' points to the head of the linked list. Upon running the provided code, the linked list gets divided into two lists, as illustrated in the diagram below.



The C code that was executed is as follows:

```
struct ListNode {
    int val;
    struct ListNode *next;
}list, list2;
5. list2 = list->next->next->next;
list2->next = list;
//LINE X
// LINE Y
list->next->next = NULL;
10. list2->next->next = NULL;
```

To successfully accomplish the task, what should be inserted at LINE X and LINE Y?

- A.

LINE X: list->next->next->next = list->next;

LINE Y: list = list->next->next;
- B.

LINE X: list->next->next = list->next;

LINE Y: list = list->next->next;
- C.

LINE X: list = list->next->next;

LINE Y: list->next->next->next = list->next;
- D.

LINE X: list->next->next->next = list->next->next;

LINE Y: list = list->next->next;

Your Answer: A

Correct Answer: A

Correct

Discuss

Q #28

Multiple Select Type

Award: 2

Penalty: 0

Compiler Design

Consider the syntax-directed translation given by the following grammar and semantic rules. Here, S is the only non-terminal and $\Sigma = \{0, 1, 2\}$ is a set of terminals.

$S.val$ denotes the synthesized attribute (a numeric value) associated with a non-terminal S , and S_1 denotes occurrences of S on the right-hand side of a production.

$S \rightarrow 0$	$\{ S.val = 0; \}$
$ 1$	$\{ S.val = 1; \}$
$ 2$	$\{ S.val = 2; \}$
$ S_0$	$\{ S.val = S_1.val * 3; \}$
$ S_1$	$\{ S.val = S_1.val * 3 + 1; \}$
$ S_2$	$\{ S.val = S_1.val * 3 + 2; \}$

Which of the following is/are true for the given translation scheme?

- A. The value computed by the translation scheme for the input string 201 is 19.
- B. The translation scheme converts the input string over $\Sigma = \{0, 1, 2\}$ to base- 10 value.
- C. The translation scheme converts the input string over $\Sigma = \{0, 1, 2\}$ to base- 3 value.
- D. The value computed by the translation scheme for the input string 201 is 20.

Your Answer: A;B

Correct Answer: A;B

Correct

Discuss

Q #29

Multiple Select Type

Award: 2

Penalty: 0

Compiler Design

Consider the following grammar

$$\begin{aligned} A &\rightarrow BB \\ B &\rightarrow b \end{aligned}$$

Suppose we draw an LR(0) automatan for the given grammar then which of the following is/are TRUE?

- A. There is exactly one state with 2 incoming and 2 outgoing transitions
- B. There is exactly one state with 1 incoming and 2 outgoing transitions
- C. There is exactly one state with 2 incoming transitions
- D. There is exactly one state with 3 outgoing transitions

Your Answer: B;C;D

Correct Answer: B;C;D

Correct

Discuss

Q #30

Multiple Choice Type

Award: 2

Penalty: 0.67

DS

You are given a complete binary tree (each level must be full except the last) on n vertices. Each vertex v is labeled by an integer value x_v . Say that a vertex is a local minimum if its label is less than the labels of each of its neighbors (neighbors include the parent and the children). Assuming that all the labels are distinct, what is the worst-case time complexity of the most efficient algorithm to find a local minimum in the tree?

- A. $\theta(n)$
- B. $\theta(\sqrt{n})$
- C. $\theta(\log n)$
- D. $\theta(n \log n)$

Your Answer: A

Correct Answer: C

Incorrect

Discuss

Q #31

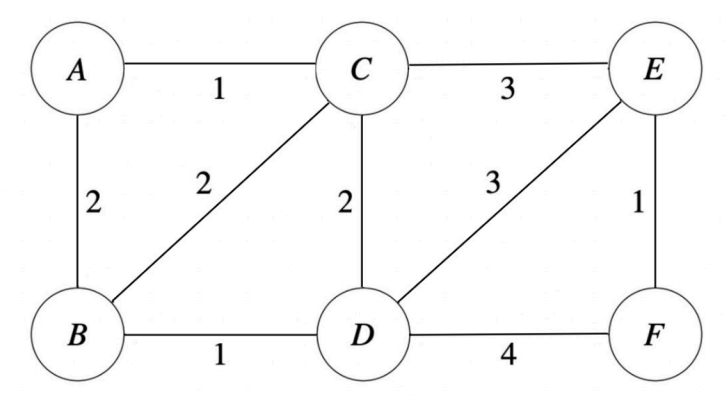
Numerical Type

Award: 2

Penalty: 0

Algorithms

Consider the following weighted graph, where the weight of every edge is written on the edge itself.



What is the number of possible minimum spanning trees for the above graph?

Your Answer: 6

Correct Answer: 6

Correct

Discuss

Q #32

Multiple Choice Type

Award: 2

Penalty: 0.67

Algorithms

Processing math: 100%

Consider the following statements related to Huffman's algorithm:

- S1: If there is exactly one symbol with a frequency of $1/3$, and all other symbols have frequencies strictly less than $1/3$, then Huffman's algorithm may produce a codeword of length 1.
- S2: If the Huffman code of a character is ' 0 ' or ' 1 ', then the frequency of this character in the code is at least 50%.

Which of the following is correct?

- A. S1 is true, and S2 is true.
- B. S1 is true, but S2 is false.
- C. S1 is false, but S2 is true.
- D. S1 is false, and S2 is false.

Your Answer: A

Correct Answer: B

Incorrect

Discuss

Q #33

Multiple Choice Type

Award: 2

Penalty: 0.67

Linear Algebra

Let A be a 2×2 matrix for which there is a constant k such that the sum of the entries in each row and each column is k . Which of the following must be an eigenvector of A ?

I. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

II. $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$.

III. $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

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

Your Answer: C

Correct Answer: C

Correct

Discuss

Q #34

Multiple Choice Type

Award: 2

Penalty: 0.67

Probability

Football teams T_1 and T_2 play two games against each other in the Premier League. It is assumed that the outcomes of the two games are independent of each other. The probabilities of T_1 winning, drawing and losing against T_2 are $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$ respectively. Each team gets 3 points for a win, 1 point for a draw, and 0 points for a loss in a game. Let X and Y denote the total points scored in these two games by team T_1 and T_2 , respectively.

What will be the value of $P(X = Y)$?

- A. $1/3$
- B. $13/36$
- C. $1/36$
- D. $1/18$

Your Answer: B

Correct Answer: B

Correct

Discuss

Q #35

Multiple Choice Type

Award: 2

Penalty: 0.67

Operating System

Imagine a computer with a 32-bit virtual address space and 1 KB pages. It uses a two-level page table system, with page-sized chunks at the inner level(not at the outer level). Suppose the code is located at address 0, and there are 100 4-byte instructions. The heap starts at page 1(indexing of page numbers starts from 0), and uses a total of 3 pages. The stack starts at the other end of the address space, i.e. 0xFFFFFFFF grows backward, and uses a total of 3 pages. What is the size needed to store this multi-level page table? (Assume the Page Table Entry (PTE) size is 4 Bytes.)

- A. 64 KB
- B. 2 KB
- C. 66 KB
- D. 16MB

Your Answer: D

Correct Answer: C

Incorrect

Discuss

Q #36

Multiple Choice Type

Award: 2

Penalty: 0.67

Operating System

Assume that for a given system, virtual addresses are 40 bits long and physical addresses are 30 bits long. The page size is 8 KB. The Translation Look-aside Buffer (TLB) in the address translation path has 128 entries. At most how many distinct virtual addresses can be translated without any TLB miss?

- A. 2^7
- B. 2^{20}
- C. 2^{13}
- D. 2^8

Your Answer: B

Correct Answer: B

Correct

Discuss

Q #37

Multiple Choice Type

Award: 2

Penalty: 0.67

Programming in C

```
#include<stdio.h>
#include<string.h>
char upstr[50];

5. void putStar (int n,char str[]){
    upstr[n] = str[n];
    if(n == strlen(str))
        return;
    else upstr[n+1] = '*';
10. putStar(n+1,str);
    }

    int main()
    {
15. char str[] = "hello";
        putStar (0, str);
        printf("%s", upstr);
    }
```

What will be the output of the given program?

- A.
- B.
- C.
- D.

Processing math: 100%

Your Answer: D Correct Answer: D Correct Discuss

Q #38 Multiple Choice Type Award: 2 Penalty: 0.67 Programming in C

```
#include <stdio.h>
int main()
{
    int i= 255;
5.    short int *s= (short int *)&i;
    printf("%d\n", *s);
}
```

What will be the output of the above program in little-endian and big-endian, respectively?

(65280 is 255×2^8)

- A. 255, 0
- B. 65280, 0
- C. 0, 0
- D. 0, 65280

Your Answer: A Correct Answer: A Correct Discuss

Q #39 Numerical Type Award: 2 Penalty: 0 Operating System

We want to use semaphores to implement a shared critical section (CS) among three threads T1, T2, and T3. We want to enforce the execution in the CS in this order: First T2 must execute in the CS. When it finishes, T1 will then be allowed to enter the CS; and when it finishes T3 will then be allowed to enter the CS; when T3 finishes then T2 will be allowed to enter the CS, and so on, (T2, T1, T3, T2, T1, T3, ...). What is the minimum number of binary semaphores we need in order to enforce this ordering?

Your Answer: 3 Correct Answer: 3 Correct Discuss

Q #40 Multiple Choice Type Award: 2 Penalty: 0.67 Computer Networks

Consider a laptop trying to access a file via HTTP from a server. The laptop knows its own IP address and the server's IP address.

Below list the following messages that appear on the Laptop's network (in the order that they would occur), by listing the letter associated with the message. All messages are used once except (c). Assume that the HTTP request and response are each single packets.

- a. Laptop: HTTP Request to Server
- b. Laptop: TCP SYN to Server
- c. Laptop: TCP ACK to Server (used three times!)
- d. Laptop: TCP FIN to Server
- e. Server: HTTP Response
- f. Server: TCP SYNACK to Laptop
- g. Server: TCP FINACK to Laptop

In each option, the leftmost message is the first message that has been communicated.

- A. a, e, c, b, f, c, d, g, c
- B. b, f, c, a, e, c, d, g, c
- C. b, f, c, d, g, c, a, e, c
- D. a, e, c, d, g, c, b, f, c

Processing math: 100%

Your Answer:

Correct Answer: B

Not Attempted

Discuss

Q #41

Multiple Select Type

Award: 2

Penalty: 0

Computer Networks

A TCP connection has been established between hosts A and B. A receives a packet from B with the following field values shown below:

- Sequence: 1001
- Acknowledgment: 5001
- Window size: 3000
- [TCP Payload Size: 52]

Note: the size of the TCP payload is not a field, but is the number of bytes in the TCP payload, which the receiver can determine from the header lengths and total length, so we treat it here as something that can be determined from the headers. TCP payload size represents total length minus header length.

Which of the following are possible valid responses from A, i.e., which represent TCP packets that A might generate immediately after receiving this packet? Keep in mind the possibility that data or ACK packets might be lost or delayed in the connection.

- A. Sequence: 5001
Acknowledgment: 1053
Window size: 2000
[TCP Payload Size: 1000]
- B. Sequence: 1053
Acknowledgment: 5001
Window size: 3000
[TCP Payload Size: 1000]
- C. Sequence: 6001
Acknowledgment: 1053
Window size: 2000
[TCP Payload Size: 1000]
- D. Sequence: 8001
Acknowledgment: 1053
Window size: 2000
[TCP Payload Size: 1000]

Your Answer:

Correct Answer: A;C

Not Attempted

Discuss

Q #42

Multiple Choice Type

Award: 2

Penalty: 0.67

Computer Networks

Consider a sliding window protocol with a window size of 5 using cumulative ACKs (and ACK is being sent for each segment).

Retransmissions: retransmissions occur under two conditions:

- Reception of three duplicate ACKs
(that is, three identical ACKs after the initial ACK)
- Time out after 100msec
(timer starts at the beginning of the packet transmission)

Timing:

Processing math: 100%

• Data packets have a transmission time of 1msec

- ACK packets have zero transmission time
- The link has a latency of 10msec.
- The source A starts off by sending its first packet at time $t = 0$.

The numbering of data packets start from 1. Also, assume the TCP receiver sends an ACK for every segment it receives.

Assume all packets are successfully delivered except the following:

- The first transmission of data packet #3
- The ACK sent in response to the receipt of data packet #6

When is data packet #3 first retransmitted (expressed in terms of msec after $t = 0$)?

- A. 23
- B. 42
- C. 43
- D. 102

Your Answer:

Correct Answer: C

Not Attempted

Discuss

Q #43

Multiple Choice Type

Award: 2

Penalty: 0.67

CO and Architecture

Suppose we use IEEE-754 single precision floating point format to represent the numbers in binary. What will be the hexadecimal representation of -2^{-146} ?

- A. 0x80000004
- B. 0x80000008
- C. 0x80000010
- D. 0x80000002

Your Answer: C

Correct Answer: B

Incorrect

Discuss

Q #44

Multiple Choice Type

Award: 2

Penalty: 0.67

CO and Architecture

Assume a cache memory with the following properties:

- The cache size (C) is 512 bytes (contains 512 data bytes)
- The cache uses an LRU (least recently used) policy for eviction.
- The cache is initially empty.

Suppose that for the following sequence of addresses sent to the cache, 0, 2, 4, 8, 16, 32, the hit rate is 0.33. Then what is the block size (B) of the cache?

- A. B = 4 bytes
- B. B = 8 bytes
- C. B = 16 bytes
- D. None of the above.

Your Answer: A

Correct Answer: B

Incorrect

Discuss

Q #45

Multiple Choice Type

Award: 2

Penalty: 0.67

Theory of Computation

Recall that a Turing machine T can be represented or 'coded' by an integer m . Let us write 'the m th Turing machine' to mean the Turing machine coded by m . Which of the following sets is not recursively enumerable?

Processing math: 100%

- A. The set of m such that the m th Turing machine halts on the input 0.
- B. The set of m such that the m th Turing machine does not halt on the input 0.
- C. The set of m such that the m th Turing machine halts on the input m .
- D. The set of n such that all Turing machines halt on the input n .

Your Answer: Correct Answer: B Not Attempted Discuss

Q #46 Numerical Type Award: 2 Penalty: 0 Theory of Computation

For a string $x = x_1 \cdots x_n \in \Sigma^*$, where Σ is any alphabet and $x_1, \dots, x_n \in \Sigma$, we write $x^{\uparrow m} = x^m$ (that is, the usual power of strings) and $x^{\downarrow m} = x_1^m \cdots x_n^m$.

For empty string $x = \varepsilon$, $\varepsilon^{\uparrow m} = \varepsilon$; $\varepsilon^{\downarrow m} = \varepsilon$.

Which of the following languages cannot be described as "context-free but not regular"? (Assume $\Sigma = \{a, b, c\}$)

- A. $\{x^{\downarrow 2} \mid x \in \Sigma^*\}$
- B. $\{(abc)^{\uparrow n} \mid n \geq 0\}$
- C. $\{x^{\uparrow 2} \mid x \in \Sigma^*\}$
- D. $\{(abc)^{\downarrow n} \mid n \geq 0\}$

Your Answer: A Correct Answer: a;b;c;d Correct Discuss

Q #47 Numerical Type Award: 2 Penalty: 0 Theory of Computation

Consider a pushdown automaton (PDA) with two control states $Q = \{q_1, q_2\}$, start state q_1 , input alphabet $\Sigma = \{a, b\}$, stack alphabet $\Gamma = \{\perp, a\}$ (where \perp is the start symbol), and transition relation:

The automaton accepts on empty stack. (In the above description, we use the general notation

to mean that when the automaton is in control state $q \in Q$ and $x \in \Gamma$ is popped from the top of the stack, the input symbol or empty string $c \in \Sigma \cup \{\varepsilon\}$ can be read to reach control state $q' \in Q$ with $\alpha \in \Gamma^*$ pushed onto the stack.)

The number of strings of length 21 accepted by the above pushdown automaton is _____.

Your Answer: 11 Correct Answer: 11 Correct Discuss

Q #48 Multiple Choice Type Award: 2 Penalty: 0.67 CO and Architecture

Your code is required to perform the function $(M\%16) * 3$. What should you do to eliminate multiplication (* and mod(%), assuming M is 32 bits wide?

Processing math: 100%

- A. shift M right by 4, shift left by 1, and add current value to itself.
- B. shift M right by 4, save the result to register, and add the saved result to current result twice.
- C. AND M with 0000000Fh, save the result to register, and add the saved result to current result twice.
- D. AND M with 0000000Fh, save the result, shift result left by 2, and add the saved result to current result.

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

Q #49 Numerical Type Award: 2 Penalty: 0 Digital Logic

For the circuit in the figure below, if the current state $Q_3Q_2Q_1Q_0$ is 6 (in decimal) i.e. $Q_3Q_2Q_1Q_0 = 0110$, then after the next positive edge of the clock signal the new state will be (in decimal)? (the flip-flops are positive edge triggered)

Your Answer: 10 Correct Answer: 9 Incorrect Discuss

Q #50 Numerical Type Award: 2 Penalty: 0 Digital Logic

You are asked to implement the following four functions with half-adders:

$$\begin{aligned} f_1 &= A \oplus B \oplus C \\ f_2 &= A'BC + AB'C \\ f_3 &= ABC' + (A' + B')C \\ f_4 &= ABC \end{aligned}$$

What is the minimum number of half-adders required to implement all four functions simultaneously? (You are not allowed to use any other logic element but half-adder)

Your Answer: 3 Correct Answer: 3 Correct Discuss

Q #51 Multiple Choice Type Award: 2 Penalty: 0.67 Set Theory & Algebra

Let S be the set of all functions $f: \mathbb{R} \rightarrow \mathbb{R}$. Consider the two binary operations $+$ and \circ on S defined as pointwise addition and composition of functions, as follows.

$$\begin{aligned} (f + g)(x) &= f(x) + g(x) \\ (f \circ g)(x) &= f(g(x)) \end{aligned}$$

Which of the following statements are true?

- I. \circ is commutative.
- II. $+$ and \circ satisfy the left distributive law $f \circ (g + h) = (f \circ g) + (f \circ h)$.
- III. $+$ and \circ satisfy the right distributive law $(g + h) \circ f = (g \circ f) + (h \circ f)$.

Processing math: 100%
A. None
B. III only

- C. II and III only
- D. I, II, and III

Your Answer: B Correct Answer: B Correct Discuss

Q #52 Multiple Choice Type Award: 2 Penalty: 0.67 Set Theory & Algebra

As a refresher, if R is an equivalence relation over a set A and $x \in A$, then the equivalence class of x in R , denoted $[x]_R$, is the set

$$[x]_R = \{y \in A \mid xRy\}$$

Let's now introduce some new notation. If R is an equivalence relation over a set A , the index of R , denoted $I(R)$, is the number of equivalence classes in R . Additionally, the width of R , denoted $W(R)$, is the number of elements in the largest equivalence class in R .

If R is an equivalence relation over a set A and $|A| = n^2 + 1$ for some positive natural number n , then which of the following must be true?

- A. $I(R) \geq n + 1$ and $W(R) \geq n + 1$.
- B. $I(R) \leq n$ and $W(R) \leq n$
- C. $I(R) \geq n + 1$ or $W(R) \geq n + 1$ (or both).
- D. $I(R) = n/2$ and $W(R) = n/2$

Your Answer: A Correct Answer: C Incorrect Discuss

Q #53 Multiple Choice Type Award: 2 Penalty: 0.67 Graph Theory

For an undirected graph G , let \bar{G} refer to the complement (a graph on the same vertex set as G , with (i, j) as an edge in \bar{G} if and only if it is not an edge in G). Consider the following statements.

- i. \bar{G} has a vertex-cover of size at most k .
- ii. \bar{G} has an independent set of size at least k .
- iii. \bar{G} has an independent set of size at least $n - k$.
- iv. \bar{G} has a clique of size at least k .
- v. \bar{G} has a clique of size at least $n - k$.

Which of the following is true for any graph G and its complement graph \bar{G} ?

- A. (i) is equivalent to (iii) and (iv).
- B. (i) is equivalent to (iii) and (v).
- C. (i) is equivalent to (ii) and (iv).
- D. (i) is equivalent to (ii) and (v)

Your Answer: Correct Answer: B Not Attempted Discuss

Q #54 Multiple Choice Type Award: 2 Penalty: 0.67 Databases

Consider the following schema:

The primary key fields are underlined, and the domain of each field is listed after the field name. Assume there are no NULL values in any column of any relation and every relation has at least one tuple. “Sid” of Reserves is foreign key to Sailors.sid.

Assume that there is at least one sailor who has reserved a boat with bid 104 in the reserves table.

Consider the following query :

```
SELECT S.sid
FROM Sailors S, Reserves R
WHERE S.rating = 10 OR R.bid = 104
```

What is the output of the above query?

- A. All sids of sailors who have a rating of 10 AND have reserved boat 104.
- B. All sids of sailors who have a rating of 10 OR have reserved boat 104.
- C. All sids of sailor table
- D. Empty set.

Your Answer:

Correct Answer: C

Not Attempted

Discuss

Q #55

Multiple Choice Type

Award: 2

Penalty: 0.67

Databases

Let $r(X, Y)$ and $s(Y)$ be two relations.

What is returned by the following relational algebra query?

- A. Values of $r.X$ which are related to every value of $s.Y$.
- B. Values of $r.Y$ which are related to every value of $s.Y$.
- C. Values of $r.X$ which are not related to some value of $s.Y$.
- D. Values of $r.X$ which are not related to any value of $s.Y$.

Your Answer:

Correct Answer: C

Not Attempted

Discuss

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

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