Subject Name: Computer Science and Information Technology

Display Number Panel: Yes
Group All Questions: No

Question Number : 1 Question Id : 7621613841 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The Cardinality of the power set of A = { X, Y, Z } is

Options :

1. 3

2. 6

3. 8

4. 9

Question Number : 2 Question Id : 7621613842 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A and B are finite sets with $|A| = m$ and $|B| = n$. If there are 2187 functions from A to B and $|B| = 3$, then $|A| =$

Options :

1. 4

2. 7

3. 9

4. 11

Question Number : 3 Question Id : 7621613843 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $f : R \rightarrow R$ is defined by $f(x) = x^2$ then $f^{-1}(-4) =$

Options :

1. $[0, 2)$

2. $[-2, 0]$

3. $(-2, 2)$

4. ϕ (null set)

If A = {1, 2, 3} and B = {2, 4, 5}, then the number of relations from A to B is

Options :

1. 8

2. 216

3. 512

4. 6

A relation R on a set A is said to be a partial order relation on A if

Options :

1. R is reflexive only

2. R is reflexive, symmetric and transitive

3. R is reflexive, anti-symmetric and transitive

4. R is both reflexive and transitive

The number of generators of G= {1, -1, i, -i } are

Options :

1. 1

2. 2

3. 3

4. 4

The coefficient of xyz^2 in the expansion of $(2x - y - 2z)^4$ is

Options :

1. -24

2. 24

3. -4

4. 4

The generating function of 1, 1, 0, 1, 1, 1, . . . is

Options :

1. $(1 + x)^2$

2. $(1 - x)^{-2} + x^2$

3. $(1 - x)^{-1} - x^2$

4. $(1 - x)^{-1} + x^2$

Question Number : 9 Question Id : 7621613849 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The eigen values of the matrix $A = \begin{bmatrix} i & 1 \\ 2 & -i \end{bmatrix}$, where $i = \sqrt{-1}$ are

Options :

1. $-i, i$

2. $-i, 1$

3. $-1, i$

4. $-1, 1$

Question Number : 10 Question Id : 7621613850 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The value of $\lim\limits_{x \to 0} \left[\dfrac{1}{x} - \dfrac{1}{e^x - 1} \right]$ is

Options :

1. 0 (zero)

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

3. 1

4. ∞

Display Number Panel: Yes
Group All Questions: No

Question Number : 11 Question Id : 7621613851 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The recurrence relation capturing the optimal time of the Tower of Hanoi problem with n discs is

Options :

1. $T(n) = 2T(n - 2) + 2$

2. $T(n) = 2T(n-1) + n$

3. $T(n) = 2T(n/2) + 1$

4. $T(n) = 2T(n-1) + 1$

Four matrices M1, M2, M3 and M4 of dimensions pxq, qxr, rxs and sxt respectively can be multiplied in several ways with different number of total scalar multiplications. For example, when multiplied as ((M1 X M2) X (M3 X M4)), the total number of multiplications is pqr + rst + prt. When multiplied as (((M1 X M2) X M3) X M4), the total number of scalar multiplications is pqr + prs + pst. If p = 10, q = 100, r = 20, s = 5 and t = 80, then the number of scalar multiplications needed is

Options :

1. 248000

2. 44000

3. 19000

4. 25000

Consider the process of inserting an element into a Max Heap, where the Max Heap is represented by an array. Suppose we perform a binary search on the path from the new leaf to the root to find the position for the newly inserted element, the number of comparisons performed is:

Options :

1. logn

2. log logn

3. n

4. n logn

The most appropriate matching for the following pairs is

P) depth first search   1) heap
Q) breadth-first search   2) queue
R) sorting   3) stack

Options :

1. P-1, Q-2, R-3

2. P-3, Q-1, R-2

3. P-3, Q-2, R-1

4. P-2, Q-3, R-1

A circularly linked list is used to represent a Queue. A single variable p is used to access the Queue. To which node should p point such that both the operations enQueue and deQueue can be performed in constant time?
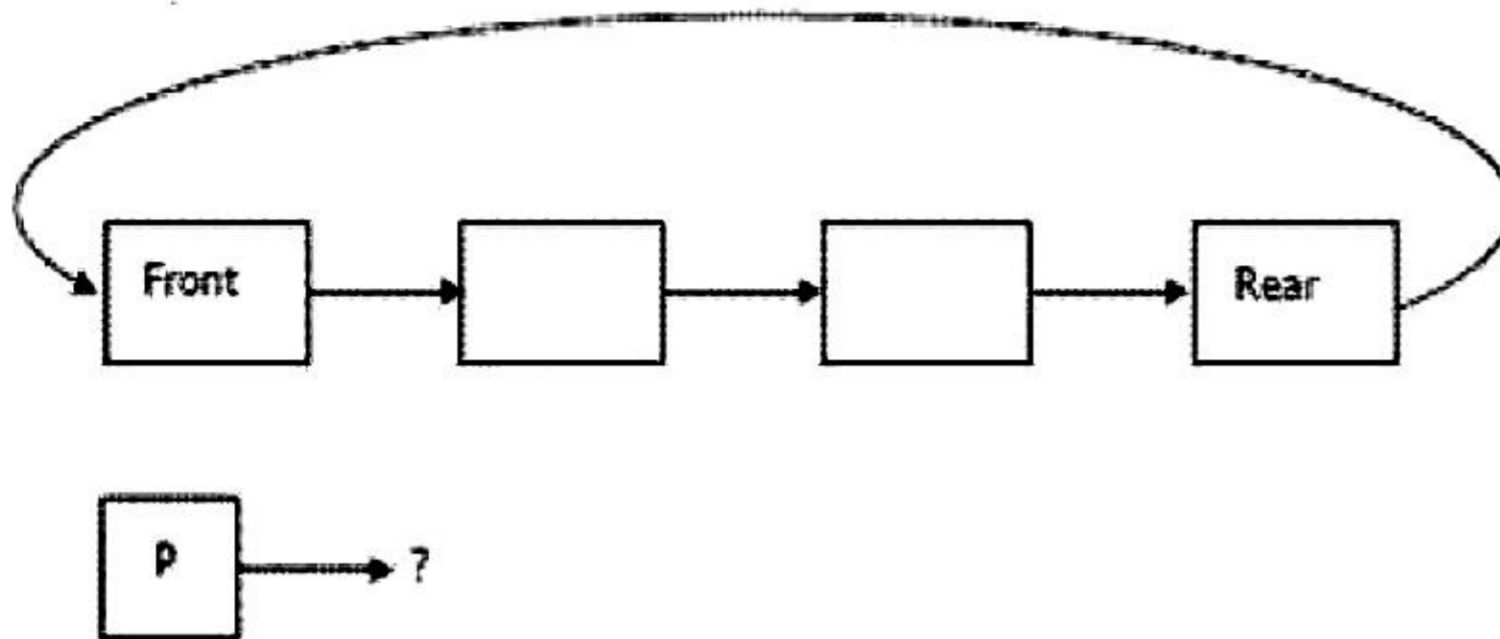
Options :

1. rear node

2. front node

3. not possible with a single pointer

4. node next to front

The time complexity of the following C function is (assume n > 0)

```
int recursive (int n)
{
  if (n == 1)     return (1);
  else   return (recursive (n-1) + recursive (n-1));
}
```

Options :

1. $O(n)$

2. $O(n \log n)$

3. $O(n^2)$

4. $O(2^n)$

Given the following input (4322, 1334, 1471, 9679, 1989, 6171, 6173, 4199) and the hash function x mod 10, which of the following statements are true?

I. 9679, 1989, 4199 hash to the same value

II. 1471, 6171 has to the same value

III. All elements hash to the same value

IV. Each element hashes to a different value

Options :

1. I only

2. II only

3. I and II only

4. III or IV

Consider the following C function.

```
float f(float x, int y)
{
  float p, s; int i;
  for (s=1, p=1, i=1; i < y; i ++)
  {
   p*= x/i;
   s+=p;
  }
  return s;
}
```

For large values of y, the return value of the function f best approximates

Options :

1. x^y

2. e^x

3. $\ln(1 + x)$

4. x^x

The running time of the following algorithm

Procedure A(n)

If n <= 2 return(1) else return A($\lfloor \sqrt{n} \rfloor$);

is best described by

Options :

1. $O(n)$

2. $O(\log n)$

3. $O(\log \log n)$

4. $O(1)$

In a complete k-ary tree, every internal node has exactly k children. The number of leaves in such a tree with n internal nodes is

Options :

1. nk

2. $(n-1)k+1$

3. $n(k-1)+1$

4. $n(k-1)$

Which of the given options provides the increasing order of asymptotic complexity of functions f1, f2, f3 and f4?

f1(n) = 2^n

f2(n) = n^(3/2)

f3(n) = n logn

f4(n) = n^(logn)

Options :

1. f3, f2, f4, f1

2. f3, f2, f1, f4

3. f2, f3, f1, f4

4. f2, f3, f4, f1

How many distinct binary search trees can be created out of 4 distinct keys?

Options :

1. 5

2. 14

3. 24

4. 42

Two main measures for the efficiency of an algorithm are

Options :
1. Processor and memory
2. Complexity and capacity
3. Time and space
4. Data and space

Question Number : 24 Question Id : 7621613864 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following case does not exist in complexity theory ?

Options :
1. Best case
2. Worst case
3. Average case
4. Null case

Question Number : 25 Question Id : 7621613865 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The worst case occurs in linear search algorithm when (a) item is somewhere in the middle of the array (b) item is not in the array at all (c) item is the last element in the array. Choose the correct combination from the following the options.

Options :
1. (a) & (b) are true
2. (a) & (c) are true
3. (b) & (c) are false
4. (b) & (c) are true

Question Number : 26 Question Id : 7621613866 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The complexity of Binary search algorithm is

Options :
1. O(n)
2. O(log n)
3. O(n^2)
4. O(n log n)

Question Number : 27 Question Id : 7621613867 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The operation of processing each element in the list is known as

Options :

1. Sorting

2. Merging

3. Inserting

4. Traversal

Consider the In-order and Post-order traversals of a tree as given below : In-order : j e n k o p b f a c l g m d h i Post-order : j n o p k e f b c l m g h i d a The Pre-order traversal of the tree shall be

Options :

1. a b f e j k n o p c d g l m h i

2. a b c d e f j k n o p g l m h i

3. a b e j k n o p f c d g l m h i

4. j e n o p k f b c l m g h i d a

The complexity of merge sort algorithm is

Options :

1. $O(n)$

2. $O(\log n)$

3. $O(n^2)$

4. $O(n \log n)$

The depth of a complete binary tree is given by

Options :

1. $D_n = n \log_2 n$

2. $D_n = n \log_2 n + 1$

3. $D_n = \log_2 n$

4. $D_n = \log_2 n + 1$

Which of the following is not a limitation of binary search algorithm?

Options :

1. it must use a sorted array

2. requirement of sorted array is expensive when a lot of insertion and deletions are needed

3. there must be a mechanism to access middle element directly

4. binary search algorithm is not efficient when the data elements are more than 1000

Question Number : 32 Question Id : 7621613872 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The asymptotic notation for defining the average time complexity is

Options :

1. Equivalence

2. Symmetric

3. Reflexive

4. Both symmetric and reflexive

Question Number : 33 Question Id : 7621613873 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The efficient data structure to insert/delete a number in a stored set of numbers is

Options :

1. Queue

2. Linked list

3. Doubly linked list

4. Binary tree

Question Number : 34 Question Id : 7621613874 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following name does not relate to stacks?

Options :

1. FIFO lists

2. LIFO list

3. Piles

4. Push-down lists

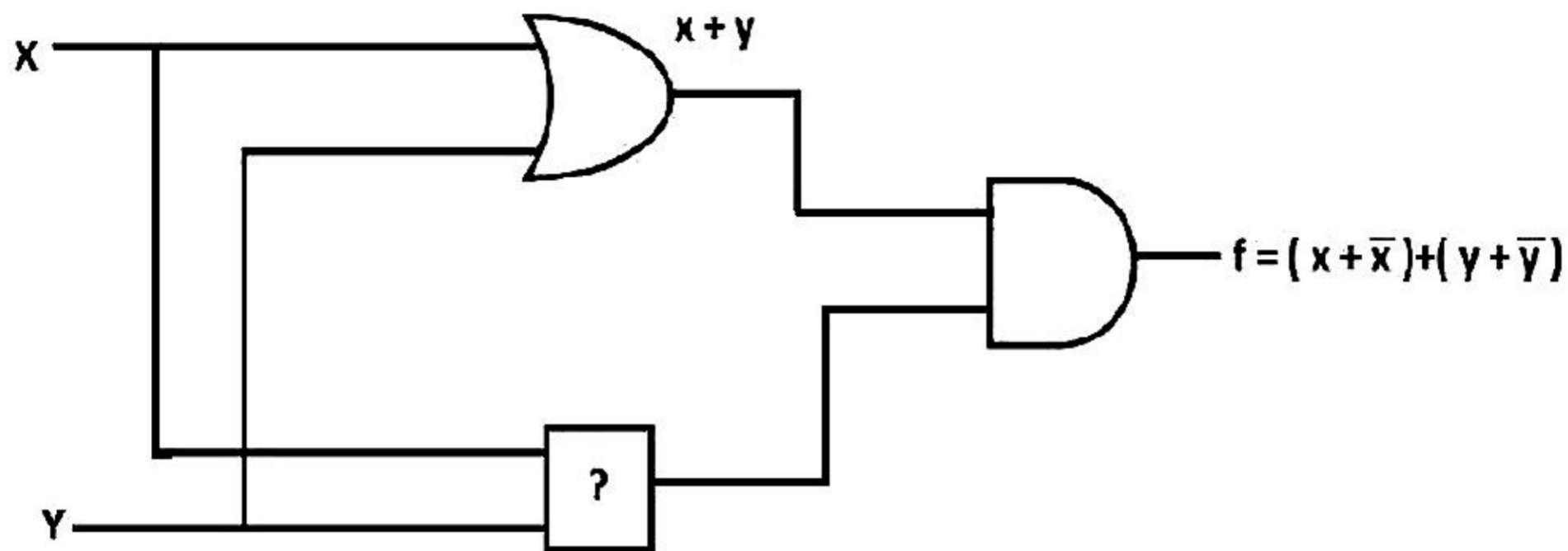**Question Number : 35 Question Id : 7621613875 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical**

Time required to merge two sorted lists of size m and n, is

Options :

1. $O(m/n)$

2. $O(m + n)$

3. $O(m \log n)$

4. $O(n \log m)$

Which one of the following logic expression is incorrect?

Options :

1. $1 \oplus 0 = 1$

2. $1 \oplus 1 \oplus 0 = 1$

3. $1 \oplus 1 \oplus 1 = 1$

4. $1 \oplus 0 \oplus 1 = 0$

What is the minimal form of the Karnaugh map shown below? Assume that X denotes a don't care term.

cd \ ab	00	01	11	10
00	1	X	X	1
01	X			1
11				
10	1			X

Options :

1. b'd'

2. b'd' + b'c'

3. b'd' + a'b'c'd'

4. b'd' + b'c' + c'd'

What is the minimum number of 2 input NAND gates required to implement the function, $F = (x'+y') (z+w)$?

Options :

1. 6

2. 5

3. 4

4. 3

To make the following circuit a tautology "? marked box" should be

$$f = (x + \bar{x}) + (y + \bar{y})$$

Options :

1. OR gate

2. AND gate

3. NAND gate

4. EX-OR GATE

Which of the following expressions is not equivalent to X ' ?

Options :

1. X NAND X

2. X NOR X

3. X NAND 1

4. X NOR 1

The simplified SOP (Sum Of Product) form of the boolean expression

(P + Q' + R') . (P + Q' + R) . (P + Q + R') is

Options :

1. (P'.Q + R')

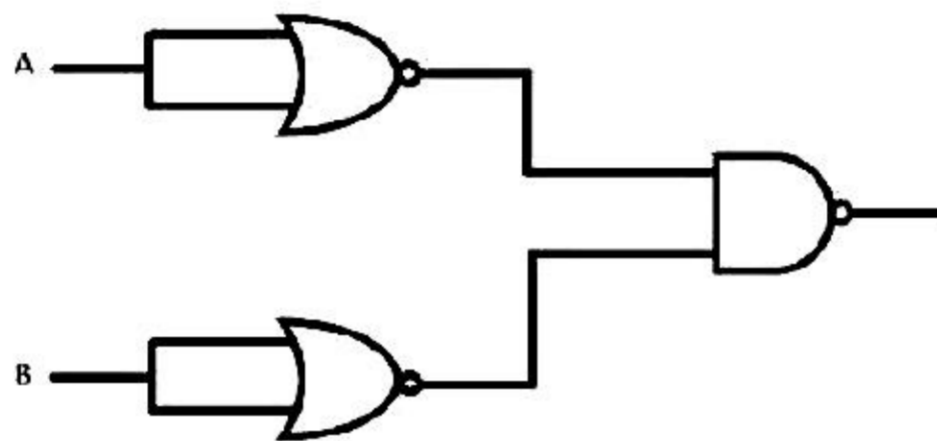2. (P + Q'.R')

3. (P'.Q + R)

4. $(P.Q + R)$

The number of full and half-adders required to add 16-bit numbers is

Options :

1. 8 half-adders, 8 full-adders

2. 1 half-adder, 15 full-adders

3. 16 half-adders, 0 full-adders

4. 4 half-adders, 12 full-adders

In the circuit shown below, which logic function does this circuit generate?

Options :

1. AND

2. NOR

3. NAND

4. OR

SHA-1 has a message digest of

Options :

1. 160 bits

2. 512 bits

3. 628 bits

4. 820 bits

Encryption and decryption provide secrecy, or confidentiality, but not

Options :

1. Authentication

2. Integrity

3. Keys

4. Frames

Which of the following are used to generate a message digest by the network security protocols?

    I. RSA   II. SHA-1   III. DES   IV. MD5

Options :

1. I and III only

2. II and III only

3. II and IV only

4. III and IV only

In the RSA public key cryptosystem, the private and public keys are (e, n) and (d, n) respectively, where $n = p*q$ and p and q are large primes. Besides, n is public and p and q are private. Let M be an integer such that $0 < M < n$ and $f(n) = (p-1)(q-1)$. Now consider the following equations.

I. $M' = Me \bmod n$, $M = (M')d \bmod n$

II. $ed \equiv 1 \bmod n$

III. $ed \equiv 1 \bmod f(n)$

IV. $M' = Me \bmod f(n)$, $M = (M')d \bmod f(n)$

Which of the above equations correctly represent RSA cryptosystem?

Options :

1. I and II

2. I and III

3. II and IV

4. III and IV

Suppose that everyone in a group of N people want to communicate secretly with the N−1 others using symmetric key cryptographic system. The communication between any two persons should not be decodable by the others in the group. The number of keys required in the system as a whole to satisfy the confidentiality requirement is

Options :

1. 2N

2. N(N-1)

3. N(N-1)/2

4. (N −1)^2

A sender is employing public key cryptography to send a secret message to a receiver. Which one of the following statements is TRUE?

Options :

1. Sender encrypts using receiver's public key

2. Sender encrypts using his own public key

3. Receiver decrypts using sender's public key

4. Receiver decrypts using his own public key

What is the appropriate pairing of items in the two columns listing various activities encountered in a software life cycle?

P) Requirements Capture	1) Module Development and Integration
Q) Design	2) Domain Analysis
R) Implementation	3) Structural and Behavioral Modeling
S) Maintenance	4) Performance Tuning

Options :

1. P-3, Q-2, R-4, S-1

2. P-2, Q-3, R-1, S-4

3. P-3, Q-2, R-1, S-4

4. P-2, Q-3, R-4, S-1

Project risk factor is considered in

Options :

1. Spiral Model

2. Waterfall Model

3. Prototyping Model

4. Iterative enhancement Model

Consider the following program module:

```
int module1 (int x, int y) {
    while (x! = y) {
        if (x > y)
            x = x - y;
        else y = y - x;
    }
    return x;
}
```

What is Cyclomatic complexity of the above module?

Options :

1. 1
2. 2
3. 3
4. 4

The worst type of coupling is

Options :

1. Data coupling

2. Control coupling.

3. Stamp coupling

4. Content coupling

The coupling between different modules of a software is categorized as follows:

I. Content coupling   II. Common coupling   III. Control coupling
IV. Stamp coupling   V.   Data coupling

Coupling between modules can be ranked in the order of strongest (least desirable) to weakest (most desirable) as follows:

Options :

1. I-II-III-IV-V

2. V-IV-III-II-I

3. I-III-V -II-IV

4. IV-II-V-III-I

Match the following:

P) Waterfall model   1) Specifications can be developed incrementally

Q) Evolutionary model   2) Requirements compromises are inevitable

R) Component-based   3) Explicit recognition of risk software engineering

S) Spiral development   4) Inflexible partitioning of the project into stages

Options :

1. P-1, Q-2, R-3, S-4

2. P-4, Q-1, R-2, S-3

3. P-4, Q-2, R-1, S-3

4. P-3, Q-1, R-2, S-4

A software project involves execution of 5 tasks T1, T2, T3, T4 and T5 of duration 10, 15, 18, 30 and 40 days, respectively. T2 and T4 can start only after T1 completes. T3 can start after T2 completes. T5 can start only after both T3 and T4 complete. What is the slack time of the task T3 in days?

Options :

1. 0

2. 3

3. 18

4. 30

Determine the maximum length of the cable (in km) for transmitting data at a rate of 700 Mbps in an Ethernet LAN with frames of size 10,000 bits. Assume the signal speed in the cable to be 2,00,000 km/s.

Options :

1. 1.750

2. 1.428

3. 2

4. 2.152

There are n stations in a slotted LAN. Each station attempts to transmit with a probability p in each time slot. What is the probability that ONLY one station transmits in a given time slot?

Options :

1. $(1-p)^{(n-1)}$

2. $p(1-p)^{(n-1)}$

3. $np(1-p)^{(n-1)}$

4. $1-(1-p)^{(n-1)}$

Consider a token ring network with a length of 2 km having 10 stations including a monitoring station. The propagation speed of the signal is 2×10^8 m/s and the token transmission time is ignored. If each station is allowed to hold the token for 2 μsec, the minimum time for which the monitoring station should wait (in μsec)before assuming that the token is lost is _____.

Options :

1. 28 to 30

2. 20 to 22

3. 0 to 2

4. 31 to 33

Which of the following is not applicable for IP?

Options :

1. Error reporting

2. Handle addressing conventions

3. Datagram format

4. Packet handling conventions

One of the header fields in an IP datagram is the Time to Live(TTL) field. Which of the following statements best explains the need for this field?

Options :

1. It can be used to prioritize packets

2. It can be used to reduce delays

3. It can be used to optimize throughput

4. It can be used to prevent packet looping

Host A sends a UDP datagram containing 8880 bytes of user data to host B over an Ethernet LAN. Ethernet frames may carry data up to 1500 bytes (i.e. MTU = 1500 bytes). Size of UDP header is 8 bytes and size of IP header is 20 bytes. There is no option field in IP header. How many total number of IP fragments will be transmitted and what will be the contents of offset field in the last fragment?

Options :

1. 6 and 925

2. 6 and 7400

3. 7 and 1110

4. 7 and 8880

Which one of the following statements is FALSE?

Options :

1. TCP guarantees a minimum communication rate

2. TCP ensures in-order delivery

3. TCP reacts to congestion by reducing sender window size

4. TCP employs retransmission to compensate for packet loss

A serial transmission Ti uses 8 information bits, 2 start bits, 1 stop bit and 1 parity bit for each character. A synchronous transmission T2 uses 3 eight bit sync characters followed by 30 eight bit information characters. If the bit rate is 1200 bits/second in both cases, what are the transfer rates of Ti and T2?

Options :

1. 100 characters/sec, 153 characters/sec

2. 80 characters/sec, 136 characters/sec

3. 100 characters/sec, 136 characters/sec

4. 80 characters/sec, 153 characters/sec

In Go–back 3 flow control protocol every 6th packet is lost. If we have to send 11 packets, how many transmissions will be needed ?

Options :

1. 10

2. 17

3. 12

4. 9

Consider an instance of TCP's Additive Increase Multiplicative Decrease(AIMD) algorithm where the window size at the start of the slow start phase is 2 MSS and the threshold at the start of the first transmission is 8 MSS. Assume that a time out occurs during the fifth transmission. Find the congestion window size at the end of the tenth transmission.

Options :

1. 7 MSS

2. 14 MSS

3. 8 MSS

4. 12 MSS

In the IPv4 addressing format, the number of networks allowed under class-C addresses is

Options :

1. 2^{14}

2. 2^{21}

3. 2^{7}

4. 2^{34}

A subnet has been assigned a subnet mask of 255.255.255.192. What is the maximum number of hosts that can belong to this subnet?

Options :

1. 14

2. 62

3. 45

4. 126

Suppose that the maximum transmit window size for a TCP connection is 12000 bytes. Each packet consists of 2000 bytes. At some point of time, the connection is in slow-start phase with a current transmit window of 4000 bytes. Subsequently, the transmitter receives two acknowledgements. Assume that no packets are lost and there are no time-outs. What is the maximum possible value of the current transmit window?

Options :

1. 4000 bytes

2. 12000 bytes

3. 10000 bytes

4. 8000 bytes

A direct mapped cache is of size 64 KB with block size 32 bytes. Logical address generated is 32 bit. How many bits are required for tag and block field respectively?

Options :

1. 16 and 11

2. 21 and 11

3. 16 and 16

4. 16 and 6

Consider a fully associative cache with 8 cache blocks (0 − 7) and the following sequence of memory block requests arrive (3, 6, 12, 17, 5, 13, 45, 3, 12, 24, 17, 20, 28, 45, 3, 27, 64, 6, 20, 12). If LRU is used, in which cache block the memory block 12 will reside?

Options :

1. 2

2. 3

3. 5

4. 6

Consider a system with cache access time 20 ns and main memory access time 140 ns. If 60% operations are read operations and hit ratio is 90%, what is the effective access time if write through updation technique is used ?

Options :

1. 75.2 ns
2. 76.4 ns
3. 83.2 ns
4. 84.4 ns

Most relevant addressing mode to write position independent code is

Options :

1. Direct
2. Indirect
3. Relative
4. Indexed Mode

How many cycles are required for a 100 MHz processor to execute a program which requires 5 seconds of CPU time?

Options :

1. 10^9 cycles
2. 50×10^7 cycles
3. 10^8 cycles
4. 50 cycles

A pipeline P is found to provide a speedup of 6.16 when operating at 100 MHz and an efficiency of 88 percent. How many stages does P have?

Options :

1. 4
2. 5
3. 6
4. 7

Which of the following is added to the page table in order to track whether a page of cache has been modified since it was read from the memory?

Options :

1. Reference bit

2. Dirty bit

3. Tag bit

4. Valid bit

Which of the following best characterizes a computer that uses memory mapped I/O?

Options :

1. the computer provides special instruction for manipulating I/O port

2. I/O ports are placed at addresses on bus and are accessed just like other memory location

3. to perform an I/O operation, it is sufficient to place the data in an address and call the channel to perform the operation

4. ports are referenced only by memory mapped instruction of the computer and are hard wired memory locations

Cache has the following specifications:

Number of sets = 128

2 way Set Associative

Cache size = 4Kbytes

Main memory has 21 bit address

What are the sizes of the cache blocks and number of cache blocks respectively?

Options :

1. 16 Bytes and 256

2. 32 Bytes and 128

3. 8 Bytes and 64

4. 16 Bytes and 64

Consider a disk drive with the following specifications: 16 surfaces, 512 tracks/ surface, 256 sectors/ track and 512 bytes/ sector. If the format overhead is 64 bytes/ sector, what is the effective track capacity?

Options :

1. 104 KB

2. 108 KB

3. 112 KB

4. 116 KB

Given the production rules of a grammar :

S -> AB

A -> BB | a

B -> AB | b

Which of the following strings cannot be generated from the above grammar ?

Options :

1. aabbb

2. aabb

3. ababab

4. abbb

Consider the expression: $(11 + 111)$* over alphabet set $\{0,1\}$. Number of states in minimal NFA and minimal DFA respectively are :

Options :

1. 3 and 4

2. 3 and 3

3. 4 and 3

4. 4 and 4

Total number of DFA's possible over input alphabet set $\{a,b\}$ with two states $\{q0$ and $q1\}$ where q0 is start state (non-final) and q1 is final state are:

Options :

1. 8

2. 16

3. 32

4. 48

Consider the following DFA :
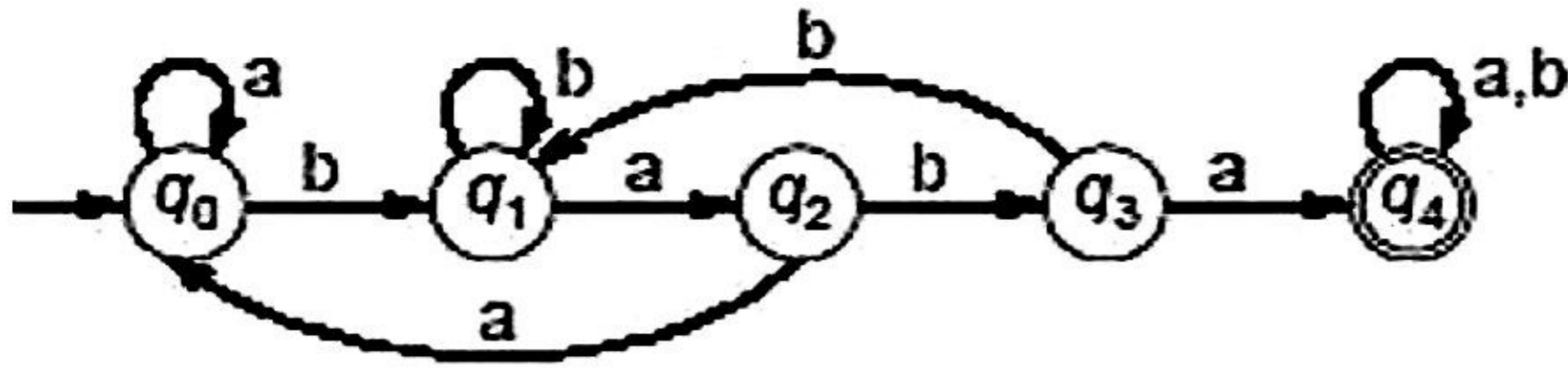
Which of the following represents the complement of the language generated by above DFA ?

Options :

1. L = {w | w contain 'abab' as substring}

2. L = {w | w contain 'baba' as substring}

3. L = {w | w does not contain 'baba' as substring}

4. L = {w | w does not contain 'abab' as substring}

Consider the following languages:

$$L1 = \{0^n 1^n 2^m \mid n,m > 0\} \qquad L2 = \{0^n 1^m 2^m \mid n,m > 0\}$$

Which of the following statements is true ? (L^c denotes the complement of L)

Options :

1. L1 ∩ L2 is CSL

2. L1 ∩ L2 is CFL

3. L1 ∩ L2 is Regular

4. $L1^c \, L2^c$ is CFL

The language accepted by the given DFA is:
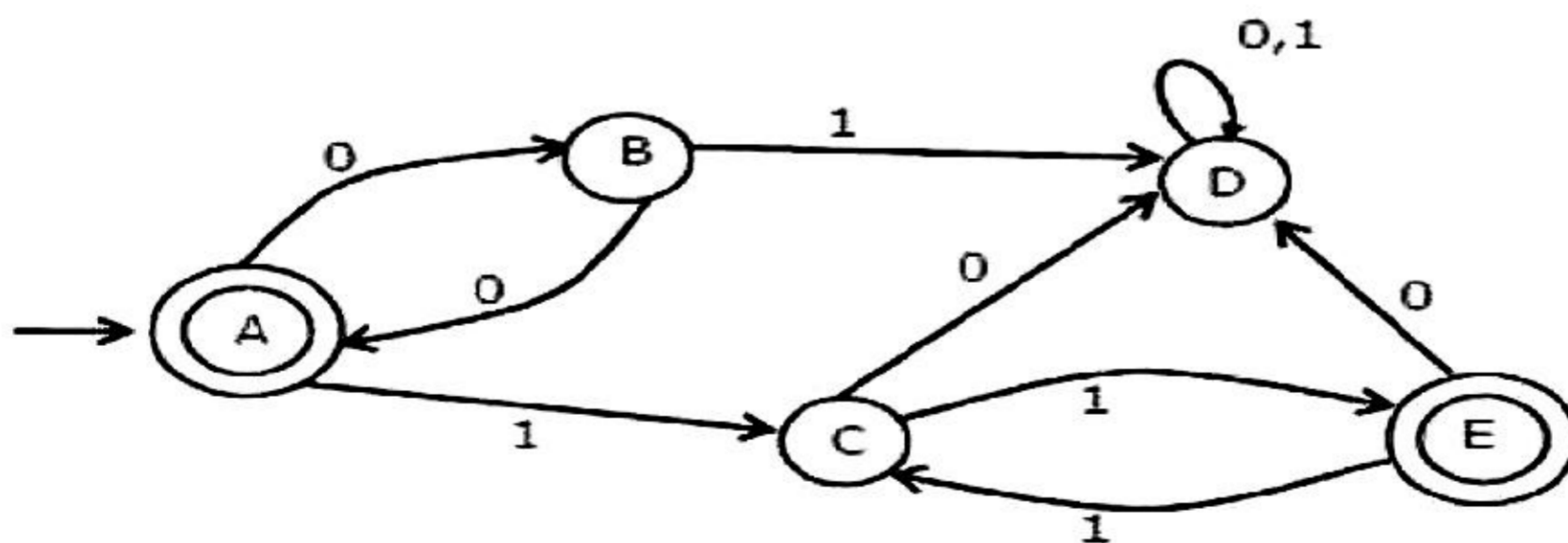
Options :

1. (0+1)* (0+1)*

2. $(0+1)^* (010)^*$

3. $(00)^* (11)^*$

4. $(0+1)^* (11)^*$

Consider PDA M = ({ q_0, q_1}, {a, b}, {a, z_0}, δ, q_0, z_0, ϕ) which accept the strings by empty stack. Given the transitions:

δ : $(q_0, a, z_0) = (q_0, az_0)$

$(q_0, a, a)\ =\ (q_0, aa)$

$(q_0, b, a)\ =\ (q_1, a)$

$(q_1, b, a)\ =\ (q_1, a)$

$(q_1, a, a)\ =\ (q_1, \epsilon)$

$(q_1, \epsilon, z_0)\ =\ (q_1, \epsilon)$

Given the strings: S1 = aaa ; S2 = aabbaa ; S3 = aba ;   S4 = aaab

Which of the above strings are accepted by the given PDA ?

Options :

1. Only S1

2. Only S2 and S3

3. Only S2

4. S2, S3 and S4

Which of the following is true ?

Options :

1. Equality problem (L1 = L2) of CFLs is decidable.

2. Emptiness of CSLs is decidable.

3. L1 $\cap$ L2 = φ is decidable for CSLs

4. Finiteness of CFLs is decidable.

Given the following grammar G: S -> aS | Sb | SS | ϵ

Consider the statements:

S1 : G is ambiguous   S2 : Language accepted by G is a*b*

S3 : G can be accepted by DPDA   S4: Language accepted by G is (a+b)*

Which are the correct statements?

1. S1, S3, S4

2. Only S1, S3

3. Only S3, S4

4. Only S1, S2, S3

Question Number : 89 Question Id : 7621613929 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Given the statements:

S1 : A non-deterministic TM can decide languages that standard TM cannot decide.

S2 : Let L be a CFL. Then L^c is Turing decidable.

Select the correct option.

Options :

1. Both S1 and S2 are True

2. Both S1 and S2 are False

3. S1 is False and S2 is True

4. S1 is True and S2 is False

Question Number : 90 Question Id : 7621613930 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following is accepted by NPDA but not by DPDA ?

Options :

1. $\{ a^k b^m c^n \mid k \neq m \text{ or } m \neq n \}$

2. $\{ a^n b^n c^n \mid n > 0 \}$

3. $\{ a^n b^n \mid n > 0 \}$

4. $\{ a^n b^m \mid n, m > 0 \}$

Question Number : 91 Question Id : 7621613931 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Given a grammar: S -> Sa | b

Which of the following is true?

Options :

1. There will be S-R conflict during parsing

2. There will be R-R conflict during parsing

3. Both S-R and R-R conflicts will be there during parsing

4. Neither of S-R or R-R conflict will arise during parsing

Question Number : 92 Question Id : 7621613932 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Given the production rules:

$P \rightarrow P\alpha Q \mid Q$

$Q \rightarrow Q\beta R \mid R$

$R \rightarrow num$

If $2\alpha 3\alpha 4\beta 1\alpha 2\beta 1$ evaluates to 18 , then correct symbols for α and β are:

Options :

1. $+$ and X

2. $+$ and $-$

3. X and $-$

4. $-$ and $+$

Question Number : 93 Question Id : 7621613933 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

$S \rightarrow aSAb \mid bSBc$

$A \rightarrow +AB \mid \varepsilon$

$B \rightarrow *BC \mid \varepsilon$

$C \rightarrow aC \mid d$

What is FOLLOW (B) ?

Options :

1. (a, b, c, d, *)

2. {a, b, d, ε, \$}

3. {a, c, d, *, \$}

4. {c, d, b, +, *}

Question Number : 94 Question Id : 7621613934 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Select the false statement.

Options :

1. No left recursive/ ambiguous grammar can be LL(1)

2. The class of grammars that can be parsed using LR methods is proper subset of the class of grammar that can be parsed by LL method

3. LR parsing is non-backtracking method

4. LR parsing can describe more languages than LL parsing

Question Number : 95 Question Id : 7621613935 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Given the following grammar with SDTs:

$X \rightarrow YZ$

$Y \rightarrow Y + Z \{print('+');\}$

$Y \rightarrow T \{Y.val = T.val\}$

$Z \rightarrow *Y \{print('*');\} \ Z$

$Z \rightarrow T \qquad \{Z.val = T.val\}$

$Z \rightarrow \varepsilon$

$T \rightarrow num \ \{print(num.val);\}$

For 2+3*2 given as input, the above grammar prints:

Options :

1. 2+3*2

2. 232*+

3. 23+2*

4. 23*2+

Question Number : 96 Question Id : 7621613936 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Cross-compiler is a compiler

Options :

1. which is written in a language that is different from the source language

2. that generates object code for its last machine

3. which is written in a language that is same as the source language

4. that runs on one machine but produces object code for another machine

Question Number : 97 Question Id : 7621613937 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Access time of the Symbol table will be logarithmic, if its implemented by

Options :

1. Linear List

2. Search Tree

3. Hash Table

4. Self organization list

Question Number : 98 Question Id : 7621613938 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following expression:

$x = a*b - c*d+e$

For generating target code, how many registers will be required apart from accumulator A?

Options :

1. 1

2. 2

3. 3

4. 4

Question Number : 99 Question Id : 7621613939 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Reduction in strength means:

Options :

1. replacing run time computation by compile time computation

2. removing loop invariant computation

3. removing common sub-expressions

4. replacing a costly operation by a relatively cheaper one

Question Number : 100 Question Id : 7621613940 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a database relation R (A,B,C,D) where the domains of A,B,C and D only include atomic values, only the following functional dependency and those that can be inferred from them hold: A -> C , B -> D. The relation is in:

Options :

1. 1NF but not in 2NF

2. 2NF but not in 3NF

3. 3NF but not in BCNF

4. BCNF but not in 4NF

Question Number : 101 Question Id : 7621613941 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a relation R={M, N, O, P, Q, R, S, T} with the following set of dependencies:

MN -> Q

M -> RQ

N -> R

R -> ST

Next consider the following set of decompositions for the relation schema R:

D1= {R1,R2,R3,R4}: R1={M,N,O,P}, R2={M,P,Q}, R3={N,R}, R4={R,S,T}

D2= {R1,R2,R3,R4}: R1={M,N,O}, R2= {P,Q}, R3= {N,R}, R4= {R,S,T}

Select the correct option:

Options :

1. D1 is lossless join whereas D2 is lossy

2. D1 is lossy whereas D2 is lossless join

3. Both D1 and D2 are lossless join

4. Both D1 and D2 are lossy

Consider the following set of functional dependency on the schema (A, B,C)

A -> BC, B -> C, A -> B, AB -> C

The canonical cover for this set is:

Options :

1. A -> BC and B -> C

2. A -> BC and AB -> C

3. A -> BC and A -> B

4. A -> B and B -> C

Which of the following statements is FALSE?

Options :

1. A prime attribute can be transitively dependent on a key in a BCNF relation

2. Any relation with 2 attributes is in BCNF

3. A relation in which every key has only one attribute is in 2NF

4. A prime attribute can be transitively dependent on a key in a 3NF relation

Which of the following scenarios may lead to an irrecoverable error in database system?

Options :

1. A transaction writes a data item after it is read by an uncommitted transaction

2. A transaction reads a data item after it is written by an uncommitted transaction

3. A transaction reads a data item after it is read by an uncommitted transaction

4. A transaction reads a data item after it is written by a committed transaction

Choose the False statement:

Options :

1. time stamp protocol is deadlock free

2. 2- phase locking generates serializability

3. Time stamp protocol may not result in recoverable schedule

4. Strict 2-phase locking is deadlock free

Consider the following table:

Test id	Center Name	Number of Students
1	Delhi	100
2	Noida	300
3	Meerut	300
4	Delhi	200
5	Kanpur	150
6	Meerut	250

How many tuples result after executing the query?

Select Center_Name, SUM (Number of Students)

group by Center_Name

having SUM (Number of Students) < 500

Options :

1. 1

2. 2

3. 3

4. 4

Let r and s be 2 relations over the relation schemas R and S respectively and let A be an attribute in R. Then the relational algebra expression : $\sigma_{A=a}$ (r$\bowtie$s) is always equal to:

Options :

1. $\sigma_{A=a}$ (r)

2. $\sigma_{A=a}$ (r) $\bowtie$s

3. r

4. s

Consider the following relation: R (A1, A2, ….An) where R contains n attributes and every (n-2) attributes of R form a candidate key. How many super keys are there in R?

Options :

1. $^{n}C_{n-2} * 2^2$

2. $^{n}C_{n-2} + 3$

3. $^{n}C_{n-2}$

4. $^nC_{n-2} + n + 1$

Consider the 2 transactions T1 and T2 and four schedules S1, S2, S3 and S4 of T1 and T2 as given below:

T1: R1[X] W1[X] W1[Y]

T2: R2[X] R2[Y] W2[Y]

S1: R1[X] R2[X] R2[Y] W1[X] W1[Y] W2[Y]

S2: R1[X] R2[X] R2[Y] W1[X] W2[Y] W1[Y]

S3: R1[X] W1[X] R2[X] W1[Y] R2[Y] W2[Y]

S4: R2[X] R2[Y] R1[X] W1[X] W1[Y] W2[Y]

Which of the following schedules are conflict serializable?

Options :

1. S1 and S2

2. S2 and S3

3. S3 only

4. S4 only

In a B Tree, suppose search key is 9 bytes long, disk block size is 512 bytes, record pointer is 7 bytes, block pointer is 6 bytes. What can be the order of B Tree node ?

Options :

1. 24

2. 25

3. 26

4. 27

The following functional dependencies hold for relations

R(A,B,C) and S(B,D,E): B -> A, A -> C. The relation R contains 200 tuples and the relation S contains 100 tuples. What is the maximum number of tuples possible in natural join R ⋈ S ?

Options :

1. 200

2. 100

3. 300

4. 20000

In fork() system call the return value to the parent process and to the child process are respectively.

Options :

1. PID of child process, 1

2. PID of child process, 0

3. PID of child process, PID of parent process

4. 1, PID of parent process

Which of the following is NOT true of deadlock prevention and deadlock avoidance schemes?

Options :

1. In deadlock avoidance, the request for resources is always granted if the resulting state is safe

2. In deadlock prevention, the request for resources is always granted if the resulting state is safe

3. Deadlock avoidance is less restrictive than deadlock prevention

4. Deadlock avoidance requires knowledge of resource requirements a priori

In context switching, processor

Options :

1. does no useful work

2. does useful work

3. properly utilizes memory and resource

4. does useful work and properly utilizes memory and resource

In a Round-Robin scheduling, s represents the time of context switching, q represents the round-robin time quantum and r represents the average time a process runs before blocking on I/O.

If $s < q < r$ then CPU efficiency is,

Options :

1. $q/(q + s)$

2. $q/(r + s)$

3. $r/(r + s)$

4. $qr/(r + s)$

Consider a program to be run on a computer in Round-Robin scheduling algorithm. The program size is 100k. Hard disk transfer rate is 1mbps. Average latency is 8 ms. Assuming no head seek, what could be the acceptable time quantum for effective CPU utilization?

Options :

1. 0.216 sec

2. 0.108 sec

3. 2.048 sec

4. 0.100 sec

Suppose two processes P and Q are there.

```
P:                          Q:
while(1)                    while(1)
{                           {
      wait(mutex);                wait(mutex);
      print '1'                   print '0'
      signal(mutex);              signal(mutex);
}                           }
```

If process P executes then only Q will execute. If we assume this then the string generated by the two processes is,

Options :

1. 1*0*

2. (10)*

3. (1|0)*

4. (0|1)*

The data blocks of a very large file in the UNIX file system are allocated using

Options :

1. contiguous allocation

2. linked allocation

3. indexed allocation

4. an extension of indexed allocation

Thrashing occurs when

Options :

1. processes on system are in waiting state

2. processes on system are in running state

3. processes on system frequently access pages not in memory

4. a page fault occurs

Suppose the time to service a page fault is on average 20 ms, while a memory access takes 10 µs, then an 80% hit ratio results in average memory access time of

Options :

1. 4008 µs

2. 3008 µs

3. 5004 µs

4. 2008 µs