GATE Sample Papers - Computer Science Engineering

1 The order of an internal node in a B+ tree index is the maximum number of children it can have. Suppose that a child pointer takes 6 bytes, the search field value takes 14 bytes, and the block size is 512 bytes. What is the order of the internal node?

A) 24
B) 25
C) 26
D) 27

Answer : (C)

2 The Boolean function x, y, + xy + x, y

A) x, + y,
B) x + y
C) x + y,
D) x, + y

Answer : (D)

3 In an MxN matrix such that all non-zero entries are covered in a rows and b columns. Then the maximum number of non-zero entries, such that no two are on the same row or column, is

A) £ a + b
B) £ max {a, b}
C) £ min {M-a, N-b}
D) £ min {a, b}

Answer : (A)

4 The relation scheme Student Performance (name, courseNo, rollNo, grade) has the following functional dependencies:

A) name, courseNo -> grade
B) rollNo, courseNo -> grade
C) name -> rollNo
D) rollNo -> name
The highest normal form of this relation scheme is

Answer : (A)

5 The minimum number of page frames that must be allocated to a running process in a virtual memory environment is determined by

A) the instruction set architecture
B) page size
C) physical memory size
D) number of processes in memory

Answer : (D)

6 Let G be a simple graph with 20 vertices and 100 edges. The size of the minimum vertex cover of G is 8. Then, the size of the maximum independent set of G is

A) 12
B) 8
C) Less than 8
D) More than 12

Answer : (A)

7 What does the following algorithm approximate? (Assume m > 1, Ĭ > 0).

```
x = m;
y-i;
while (x - y > Ĭ)
{ x = (x + y) / 2 ;
y = m/x ;
}
print (x) ;
```

A) log m
B) m2
C) m1/2

D) m1/3

Answer : (C)

8 Consider the following C program

```
main ()
{ int x, y, m, n ;
scanf ("%d %d", &x, &y);
/ * Assume x > 0 and y > 0 * /
m = x; n = y ;
while ( m ! = n)
{ if (m > n)
m = m — n;
else
n = n - m ; }
printf("%d",n); }
```

The program computes

A) x + y, using repeated subtraction
B) x mod y using repeated subtraction
C) the greatest common divisor of x and y
D) the least common multiple of x and y

Answer : (C)

9 The best data structure to check whether an arithmetic expression has balanced parentheses is a

A) queue
B) stack
C) tree
D) list

Answer : (B)

10 A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is given below: 10, 8,5,3,2 Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is

A) 10,8,7,5,3,2,1
B) 10,8,7,2,3,1,5
C) 10,8,7,1,2,3,5
D) 10,8,7,3,2,1,5

Answer : (D)

11 An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be

A) 255.255.0.0
B) 255.255.64.0
C) 255.255.128.0
D) 255.255.252.0

Answer : (D)

12 Suppose the round trip propagation delay for a 10 Mbps Ethernet having 48-bit jamming signal is 46.4 ms. The minimum frame size is:

A) 94
B) 416
C) 464
D) 512

Answer : (C)

13 The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?

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

Answer : (B)

14 Consider the following C function:

```
int f (int n)
{ static int i = 1;
if (n >= 5) return n;
n = n + i;
i ++;
return f (n);
}
```
The value returned by f(1) is

A) 5
B) 6
C) 7
D) 8

Answer : (C)

15 The minimum number of page frames that must be allocated to a running process in a virtual memory environment is determined by

A) the instruction set architecture
B) page size
C) physical memory size
D) number of processes in memory

Answer : (D)

1 The address resolution protocol (ARP) is used for

A) Finding the IP address from the DNS
B) Finding the IP address of the default gateway
C) Finding the IP address that corresponds to a MAC address
D) Finding the MAC address that corresponds to an IP address

Answer : (D)

2 Consider the following relation schema pertaining to a students database:

Student (rollno, name, address)
Enroll (rollno, courseno, coursename)
where the primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 120 and 8 respectively. What are the maximum and minimum number of tuples that can be present in (Student * Enroll), where '*'denotes natural join?

A) 8, 8
B) 120, 8
C) 960, 8
D) 960, 120

Answer : (C)

3 Consider a direct mapped cache of size 32 KB with block size 32 bytes. The CPU generates 32 bit addresses. The number of bits needed for cache indexing and the number of tag bits are respectively

A) 10, 17
B) 10, 22
C) 15, 17
D) 5, 17

Answer : (A)

4 The goal of structured programming is to

A) have well indented programs
B) be able to infer the flow of control from the compiled code
C) be able to infer the flow of control from the program text
D) avoid the use of GOTO statements

Answer : (C)

5 The tightest lower bound on the number of comparisons, in the worst ease, for comparison-based sorting is of the order of

A) n
B) n 2
C) n log n
D) n log2 n

Answer : (B)

6 Let G be a simple graph with 20 vertices and 100 edges. The size of the minimum vertex cover of G is 8. Then, the size of the maximum independent set of G is

A) 12
B) 8
C) Less than 8
D) More than 12

Answer : (A)

7 WA and B are the only two stations on an Ethernet. Each has a steady queue of frames to send. Both A and B attempt to transmit a frame, collide, and A wins the first backoff race. At the end of this successful transmission by A, both A and B attempt to transmit and collide. The probability that A wins the second backoff race is

A) 0.5
B) 0.625
C) 0.75
D) 1.0

Answer : (A)

8 Let A be a sequence of 8 distinct integers sorted in ascending order. How many distinct pairs of sequences, B and C are there such that (i) each is sorted in ascending order, (ii) B has 5 and C has 3 elements, and (iii) the result of merging B and C gives A?

A) 2
B) 30
C) 56
D) 256

Answer : (D)

9 In a network of LANs connected by bridges, packets are sent from one LAN to another through intermediate bridges. Since more than one path may exist between two LANs, packets may have to be routed through multiple bridges.
Why is the spanning tree algorithm used for bridge-routing?

A) For shortest path routing between LANs
B) For avoiding loops in the routing paths
C) For fault tolerance
D) For minimizing collisions

Answer : (B)

10 A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is given below: 10, 8,5,3,2 Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is

A) 10,8,7,5,3,2,1
B) 10,8,7,2,3,1,5
C) 10,8,7,1,2,3,5
D) 10,8,7,3,2,1,5

Answer : (D)

11 An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be

A) 255.255.0.0
B) 255.255.64.0
C) 255.255.128.0
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Answer : (D)

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The problems 3-SAT and 2-SAT are

A) both in P
B) both NP-complete
C) NP-complete and in P respectively
D) undecidable and NP-complete respectively

Answer : (C)

2 Consider the following relation schema pertaining to a students database:
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where the primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 120 and 8 respectively. What are the maximum and minimum number of tuples that can be present in (Student * Enroll), where '*'denotes natural join?

A) 8, 8
B) 120, 8
C) 960, 8
D) 960, 120

Answer : (C)

3 Consider a relation scheme R = (A, B, C, D, E, H) on which the following functional dependencies hold : (A -> B, BC -> D, E -> C, D -> A). What are the candidate keys of R?

A) AE, BE
B) AE, BE, DE
C) AEH, BEH, BCH
D) AEH, BEH, DEH

Answer : (D)

4 The goal of structured programming is to

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B) be able to infer the flow of control from the compiled code
C) be able to infer the flow of control from the program text
D) avoid the use of GOTO statements

Answer : (C)

5 The tightest lower bound on the number of comparisons, in the worst ease, for comparison-based sorting is of the order of

A) n
B) n 2
C) n log n
D) n log2 n

Answer : (B)

6 A circuit outputs a digit in the form of 4 bits. 0 is represented by 0000,1 by 0001,..., 9 by 1001. A combinational circuit is to be designed which takes these 4 bits as input and outputs 1 if the digit ^{3} 5, and 0 otherwise. If only AND, OR and NOT gates may be used, what is the minimum number of gates required

A) 2
B) 3
C) 4
D) 5

Answer : (C)

7 WA and B are the only two stations on an Ethernet. Each has a steady queue of frames to send. Both A and B attempt to transmit a frame, collide, and A wins the first backoff race. At the end of this successful transmission by A, both A and B attempt to transmit and collide. The probability that A wins the second backoff race is

A) 0.5
B) 0.625

C) 0.75
D) 1.0

Answer : (A)

8 If 73x (in base-x number system) is equal to 54y (in base-y number system), the possible values of x and y are

A) 8, 16
B) 10, 12
C) 9, 13
D) 8, 11

Answer : (D)

9 In a packet switching network, packets are routed from source to destination along a single path having two intermediate nodes. If the message size is 24 bytes and each packet contains a header of 3 bytes, then the optimum packet size is

A) 4
B) 6
C) 7
D) 9

Answer : (D)

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A) 10,8,7,5,3,2,1
B) 10,8,7,2,3,1,5
C) 10,8,7,1,2,3,5
D) 10,8,7,3,2,1,5

Answer : (D)

11 Consider an operating system capable of loading and executing a single sequential user process at a time. The disk head scheduling algorithm used is First Come First Served (FCFS). If FCFS is replaced by Shortest Seek Time First (SSTF), claimed by the vendor to give 50% better benchmark results, what is the expected improvement in the I/O performance of user programs ?

A) 50%
B) 40%
C) 25%br> D) 0%

Answer : (D)

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

A) 5
B) 14
C) 24
D) 42

Answer : (B)