

## SAMPLE ENTRANCE EXAM QUESTIONS FOR MSc IN COMPUTER SCIENCE

- 1) The statement `printf("%d",sizeof(""));` displays
- a) 0
  - b) 1
  - c) garbage
  - d) error message
  - e) none of the above
- 2) The rule for implicit type conversion is
- a) `int < unsigned < float`
  - b) `unsigned < int < float < double`
  - c) `int < unsigned < double < float`
  - d) `unsigned < int < double < float`
- 3) Consider the declaration `char street[10] = "abcdefghi";` Choose the correct remark(s)
- a) `&street` and `street` will have different values
  - b) `&street` is meaningless
  - c) `street` is meaningless
  - d) `&street+1` and `street+1` will have the same values
  - e) `street` is a constant string
  - f) none of the above
- 4) Consider the function `find(int x, int y) { return ((x<y) ? 0:(x-y)); }` `find(a,b)` computes
- a) maximum of a, b
  - b) sum of a, b
  - c) positive difference of a, b
  - d) negative difference of a, b
  - e) minimum of a, b
- 5) Frames from one LAN can be transmitted to another LAN via the device
- a) router
  - b) bridge
  - c) repeater
  - d) modem
  - e) gateway
  - f) firewall
- 6) The errors that can be pointed out by compilers are
- a) syntax errors
  - b) semantic errors
  - c) logical errors
  - d) internal errors
  - e) hardware errors
  - f) all of the above
- 7) Which of the i)  $\sqrt{2}$  ii)  $e$  iii) 1.2323232323... iv)  $\Pi$  v) 10.2 are irrational numbers?
- a) i
  - b) i, iii, and iv
  - c) i, and iv
  - d) i, ii, and iii
  - e) iii and v
  - f) i and iii

- 8) A recursive function  $f(x)$ , is defined as follows:  
 if  $(x > 100)$  return  $(x - 10)$ ;  
 else return  $(f(f(x + 11)))$ ;  
 for which of the following values of  $x$ ,  $f(x) = 91$ ?
- a) 100                                      c) 1                                      e) all of the above  
 b) 91    d) 101                                      f) none of these
- 9) The halting problem is to determine
- a) if all Turing machines halt.                                      d) if a Turing machine halts on all  
 b) if a Turing machine halts on all                                      correct input  
 input    e) none of the above  
 c) if a Turing machine halts on a  
 given input
- 10) The number of elements in the power set of the set  $\{\{\}, 1, \{2, 3\}\}$  is
- a) 2    c) 4    e) 8  
 b) 3    d) 6    f) 16
- 11) Given two sorted list of size  $m$  and  $n$  respectively. The number of comparisons needed in the worst case by the merge sort algorithm will be
- a)  $m \times n$                                       c) minimum of  $m, n$   
 b) maximum of  $m, n$                                       d)  $m + n - 1$
- 12) Let  $R(a, b, c)$  and  $S(d, e, f)$  be two relations in which  $d$  is the foreign key of  $S$  that refers to the primary key of  $R$ . Consider the following four operations.
- a) insert into  $R$                                       c) delete from  $R$   
 b) insert into  $S$                                       d) delete from  $S$
- 13) Which of the following is true about the referential integrity constraint above?
- a) none of them can cause any                                      d) operations II & III can cause  
 violation    violation  
 b) all of them can cause violation                                      e) operations I & II can cause  
 c) operations I & IV can cause                                      violation  
 violation    f) operations III & IV can cause  
 violation

14) As part of the maintenance work, you are entrusted with the work of rearranging the library books in a shelf in proper order, at the end of each day. The ideal choice will be

- a) bubble sort
- b) selection sort
- c) insertion sort
- d) heap sort
- e) quick sort
- f) random sort

15) Page fault occurs when

- a) the page is corrupted by application software
- b) the page is in main memory
- c) the page is not in main memory
- d) one tries to divide a number by 0
- e) we get a cache miss

16) The common (if-then-else) construct of structural programming languages can be expressed as

- a) context free language
- b) context sensitive language
- c) recursive language
- d) recursively enumerable language
- e) all of the above
- f) none of the above

17) To avoid the race condition the number of processes that may be simultaneously inside their critical section is

- a) 0
- b) 1
- c) 2
- d) 4
- e) 8
- f) dependent on the number of cores of CPU

18) Suppose we toss a *biased* coin with a bias towards head (that is, the probability of head is slightly more than that of tail) many times. Then

- a) probability that sequence HT occurs is more than that of sequence TH
- b) probability that sequence HT occurs is less than that of sequence TH
- c) probability that sequence HT occurs is independent of that of sequence TH
- d) probability that sequence HT occurs is dependent on that of sequence TH
- e) the probabilities of sequence HT and TH depends on the bias of the coin
- f) none of the above

19) Which of the following operations is performed more efficiently by doubly linked list than by linear linked list?

- a) Searching an unsorted list for a given item .
- b) Deleting a node whose location is given.
- c) Traversing the list to process each node.
- d) Deleting the node next to the given location.
- e) Inserting a node after the node with a given location.

20)  $m$  men and  $n$  women are to be seated in a row so that no two women sit together. Then the number of ways in which they can be seated is

- a)  $m!n!/(m+n)!$
- b)  $m!n!/(m-n+1)!$
- c)  $n!(n+1)!/(m-n+1)!$
- d)  $m!(m+1)!/(m-n+1)!$
- e)  $m!/(m-n+1)!$

21) Which one is good for insertion, deletion, and searching?

- a) Red-Black tree
- b) B-tree
- c) Balanced binary tree
- d) AVL tree
- e) all of the above

22) If in an average personal computer a program is using swap memory to run, the speed of program will largely depend on

- a) bus speed
- b) network speed
- c) process speed
- d) memory speed
- e) hard disk speed

23) In the big  $O$  notation which of the following is worst case complexity, where  $k$  is a large unspecified constant?

- a)  $O(k^l)$
- b)  $O((n+k)^k)$
- c)  $O(n^k)$
- d)  $O(n^{2^2})$
- e)  $O(n^{\log n})$

24) In C++, run time polymorphism is achieved by \_\_\_\_\_

- a) friend function
- b) virtual function
- c) operator overloading
- d) function overloading

25) The sides AB, BC, CA of a triangle ABC have 3, 4, and 5 interior points respectively on them. The total number of triangles that can be constructed by using these points as vertices is

- a) 195
- b) 220
- c) 200
- d) 204
- e) 205

26) The number of ways to cut a six sided convex polygon whose vertices are labeled into four triangles using diagonal lines that do not cross is

- a) 12
- b) 13
- c) 14
- d) 10
- e) 11

27) What is the output of the following 'C' program?

```
main() {
    int i=32, j=0x20, k, l,m;
    k = i | j;
    l = i & j;
    m = k ^ l;
    printf("%d %d %d %d %d",i, j, k, l, m);
}
```

- a) 0 0 0 0 0
- b) 32 32 32 32 32
- c) 0 32 32 32 32
- d) 32 32 32 32 0
- e) 32 0 0 0 0

28) The parameter passing method in C programming language is

- |                         |                      |                  |
|-------------------------|----------------------|------------------|
| a) call by copy-restore | b) call by reference | d) call by value |
|                         | c) call by sharing   | e) call by name  |

29) System calls in Unix for 80386 and similar architectures is implemented using

- |                   |             |                      |
|-------------------|-------------|----------------------|
| a) interrupt call | c) hardware | d) software          |
| b) function call  | interrupts  | interrupts           |
|                   |             | e) system interrupts |

30) The IPv4 address consists of

- a) 32 bits
- b) 64 bits
- c) 16 bits
- d) 128 bits
- e) 8 bits

31) Let  $A$  and  $B$  be two sets of words (strings) from  $\Sigma^*$ , for some alphabet of symbols  $\Sigma$ . Suppose that  $B$  is a subset of  $A$ . Which of the following statements must always be true of  $A$  and  $B$ ?

- a) If  $A$  is finite, then  $B$  is finite.
- b) If  $A$  is regular, then  $B$  is regular.
- c) If  $A$  is RE, then  $B$  is RE.
- d) If  $A$  is context-free, then  $B$  is context-free.
- e) If  $A$  is infinite, then  $B$  is infinite.

32) Suppose we toss an unbiased coin an unspecified odd number of times. What is the probability that number of heads is greater than number of tails.

- a) 1
- b) larger than  $1/2$
- c) equal to  $1/2$
- d) less than  $1/2$
- e) 0

33) There are four pairs of brothers and sisters. In how many ways can you pair all of them, a boy and girl in each pair, such that no siblings are in the same pair.

- a) 24
- b) 28
- c) 15
- d) 9
- e) 6

34) Consider the following statements about user level threads and kernel level threads. Which one of the following statements is FALSE?

- a) Context switch time is normally longer for kernel level threads than for user level threads.
- b) User level threads do not need any hardware support
- c) Related kernel level threads can be scheduled on different cores in a modern multicore processor.
- d) Blocking one kernel level thread always blocks all related threads
- e) User threads are normally created by threading libraries.

35) A list of integers is read in, one at time, and a BST is constructed. Next the tree is traversed and the integers are printed. Which traversal would result in a printout that duplicates the original order of the list of integers?

- a) preorder                      c) inorder                      e) none of these  
 b) postorder                      d) heaporder

36) If the address of  $A[1,1]$  and  $A[2,1]$  in a C program are 1000 and 1010 respectively and each element occupies 2 locations, then the array has been stored in

- a) row major                      c) compiler dependent                      e) none of these  
 b) column major                      d) machine dependent

37) Suppose that  $P(x, y)$  means "x is a parent of y",  $M(x)$  means "x is male" and  $F(x)$  means "x is female". If  $S(v, w)$  is

$$F(v) \wedge \exists x \exists y (M(x) \wedge P(x, y) \wedge P(x, v) \wedge (y \neq v) \wedge P(y, w))$$

What is the meaning of the expression  $S(v, w)$ ?

- a) v is sister of w.  
 b) v is niece of w.  
 c) v is aunt of w.  
 d) v is grandmother of w.

**Some practice problems to assist in personal study**

38) Solve the recurrence relation  $u_n = u_{n-1} - u_{n-2} + u_{n-3}$ ,  $u_0 = u_1 = 0$ ,  $u_2 = 1$

39) Construct a logical expression for S for the following table (X is any arbitrary value):

P	Q	R	S
T	F	F	T
F	F	F	T
T	T	F	T
F	T	F	F
T	T	T	F
T	F	T	T
F	T	T	F
F	F	T	X

40) Suppose you have a complete binary tree of depth d, root is at depth 0, and each node is connected in a doubly linked list. How many pointers will you need in the whole data structure?

41) It is possible to travel between city 'A' to City 'C' either directly or going via City 'B'. During the period 6 PM to 7 pm ; the average trip time as follows

A to B 15 Minutes

B to C 30 Minutes

A to C 30 Minutes

The maximum capacities of the routes are

A to B 3000 Vehicles

B to C 2000 Vehicles

A to C 4000 Vehicles

Represent the flow of traffic from 'A' to 'C' during the time period 6 PM to 7 PM.?

42) Write a small correct program that uses Unix system call fork().

43) How does signal system call work? How to mask signals delivered to processes?

44) Find the value the infinite series  $1 + (1+x)/2! + (1+x+x^2)/3! + (1+x+x^2+x^4)/4! + \dots \infty$

45) Prove that the function  $f(n) = 2^n - n^2$  is not a one-to-one function.

46) Mathematical expressions can be expressed through binary trees. Draw the binary tree for the expression  $(a+(b/c))*((d-e))$ .

47) Convert the following infix expression into postfix form  $((A-B+C)*D)(E+F)$ .

48) Match the following:

P. SMTP	1. Application layer
Q. BGP	2. Transport layer
R. TCP	3. Data link layer
S. PPP	4. Network layer
	5. Physical layer

49) How many words can be formed with the letters of MISSISSIPPI such that no S's are near but all I's are together?

50) Prove that  $n^{\text{th}}$  term of the Fibonacci sequence is less than or equal to  $1.65^n$ .

51) Construct a sequential circuit using JK flip-flops that will output 00, 10, 11, 01, cyclically.

52) Write a program that prints first n numbers which are neither prime nor Fibonacci numbers.

53) If n numbers from a uniform random sequence are inserted in a B-tree what is the expected height.

54) Show the final form of AVL tree built from a sequence of insertions corresponding to the following keys: 6, 7, 8, 12, 15, 17, 9, 10.

55) Give an algorithm that checks whether the given binary tree is a binary search tree.

56) Prove the sequence  $f(n) = (2n-3)/3n+4$  is

a) monotonically increasing

b) bounded

and find its limiting value as  $n$  tends to infinity.