Modele de grile pentru proba 1
examenul de evaluare a cunoștințelor fundamentale și de specialitate

Calculatoare engleză

Sesiunea: Iulie 2025

1. The result of a logical AND operation between an IPv4 address and the network mask is:
a) The broadcast address of the network which includes the IP address
b) The network address of the network which includes the IP address
c) Always 255.255.255.255
d) Always 0.0.0.0

2. Which of the following statements regarding the IPv4 subnetwork mask is true:
a) It is represented on 64 bits
b) It is represented on 24 bits
c) Includes 24 bits 1 in binary representation
d) The last group of 8 bits is 256 in decimal representation

3. Am IPv6 IP address is represented on:
a) 32 bits
b) 128 bits
c) 64 bits
d) 265 bits

4. An Ethernet address is represented on:
a) 24 bits
b) 32 bits
c) 48 bits
d) 128 bits

5. Which layer of the TCP/IP Model corresponds to the Data Link Layer of the OSI Reference Model?
a) Transport
b) Hardware
c) Network Interface
d) Internet

6. Which of the following languages may NOT be considered as formal languages?
a) English-like idioms
b) Pascal-like pseudocode
c) Flowchart language
d) A programming language

7. When we state that *program units should have access only to the information they require*, we call that:
a) Simplicity
b) Modularity
c) Information hiding
d) Efficiency

8. When program execution becomes a systematic search in a set of facts, making use of a set of inference rules, we say it reflects a basic property of the:
a) imperative paradigm
b) object oriented paradigm
c) functional paradigm
d) logic paradigm

9. Sending messages between program entities to simulate the temporal evolution of a set of real world phenomena - best describes the:
a) imperative paradigm
b) object oriented paradigm
c) functional paradigm
d) logic paradigm

10. Given the algorithm:
      count ← 0
      <u>repeat</u>
            WRITE count
            count ← count+1
      <u>until</u> count ≥ 10
How many times is the loop executed?

a) 9 times
b) 10 times
c) 11 times
d) none of the above

11. The representation step represents:
a) the difference between the largest representable positive number and the smallest representable positive number
b) the difference between the largest representable negative number and the smallest representable negative number
c) the distance between two consecutive representable numbers
d) the distance between any two representable numbers

12. In version I of the complementary code, the weight of the sign bit is:
a) 0
b) n, where n represents the number of digits from the integer part
c) negative
d) it has no weight

13. Which of the following statements, regarding floating-point representation, is not true:
a) It has the advantage of extending the representation range
b) The relative error is smaller than in the case of fixed-point representation
c) It has the disadvantage of complex algorithms for arithmetic operations
d) It has the disadvantage of a complex logical-arithmetic unit

14. Which of the following statements about a number in normalized representation is true:
a) All bits of the mantissa are 1
b) The most significant bit of the mantissa is 1
c) All bits of the exponent are 1
d) The most significant bit of the exponent is 1

15. Which of the following is not part of the 5-unit structure of a digital computer:
a) Input unit
b) Arithmetic-logic unit
c) Control unit
d) Direct Memory Access (DMA) unit

16. What is the maximum number of nodes in a binary search tree with height = 5?
   Obs. The height of a tree is the maximum depth of any leaf node from the root node, or the length of the longest path (i.e., the number of edges) from the root node to any leaf node.
a) 2^6-1
b) 2^5-1
c) 2^5
d) 2^6

17. Which of these tree traversal methods is used to output the contents of a binary search tree in ascending order?
a) Pre-Order
b) In-Order
c) Post-Order
d) Depth-First

18. What is the worst case time complexity for search, insert and delete operations in a general Binary Search Tree?
a) O(n) for all
b) O(Log n) for all
c) O(Log n) for search and insert, and O(n) for delete
d) O(Log n) for search, and O(n) for insert and delete
19. What is an AVL tree?
a) a binary search tree which is perfectly balanced
b) a binary search tree which is almost balanced (i.e., height difference is at most 1)
c) a binary tree which is perfectly balanced
d) a multiway tree which is almost balanced (i.e., for all nodes the balance factor may be -1, 0 or 1)

20. What is the maximum height of an AVL tree with p nodes?
a) p
b) log(p)
c) log(p)/2
d) p/2

21. The requirement that each entity has a unique primary key and the value of the primary key is not null is known as:
a) Entity Integrity Rule
b) Referential Integrity Rule
c) Validation Index
d) Entity- Relationship Rule

22. Which of the following makes it possible for entities to share a relationship?
a) Mult-valued attribute
b) A foreign Key
c) A common attribute
d) The same number of attributes

23. An Entity is
a) An instance of an Entity Type that is uniquely identifiable
b) An instance of a DBA that is uniquely identifiable
c) An instance of a type that is uniquely identifiable
d) None of the above

24. Which of the following SQL statements deletes all rows in the table called SalesData?
a) Delete * From SalesData
b) Delete ALL SalesData
c) Delete From SalesData
d) Delete SalesData

25. Weak Entity type is:
a) An entity type that is not existence-independent on another entity type
b) An entity type that characterizes a DBMS
c) An entity type that is existence-dependent on another entity type
d) None of the above

26. What is the equivalent expression for $x \oplus \bar{y}$?

a) $x \oplus y$

b) $x \odot y$

c) $x \mid y$

d) $x\bar{y} + \bar{x}y$

27. Consider the switching function with 4 variables:

$f(a,b,c,d) = \Sigma(1,2,4,5,6,7,9) + \Sigma_d(10,12,13,14)$

Using KV maps determine which of the following forms represents the minimal disjunctive form:

a) $ab + cd + \bar{c}d$

b) $ab\bar{c} + \bar{b}d + ac$

c) $\bar{a}b + \bar{c}d + c\bar{d}$

d) $ab + \bar{a}d + \bar{c}d$

28. Given a MUX 8 with 8 data inputs I_0, I_1, I_2, I_3, I_4, I_5, I_6, I_7, three selection inputs S_0, S_1, S_2, whew S_2 is MSB and Y output in positive logic. The switching function $f(x,y,z) = \prod(2,3,5,6)$ is implemented with a single MUX 8 like this:

a) $(I_0, I_1, I_2, I_3, I_4, I_5, I_6, I_7)$ = (0, 0, 1, 1, 0, 1, 1, 0) and (S_0, S_1, S_2) = (x, y, z)

b) $(I_0, I_1, I_2, I_3, I_4, I_5, I_6, I_7)$ = (0, 0, 1, 1, 0, 1, 1, 0) and (S_2, S_1, S_0) = (x, y, z)

c) $(I_0, I_1, I_2, I_3, I_4, I_5, I_6, I_7)$ = (1, 1, 0, 0, 1, 0, 0, 1) and (S_0, S_1, S_2) = (x, y, z)

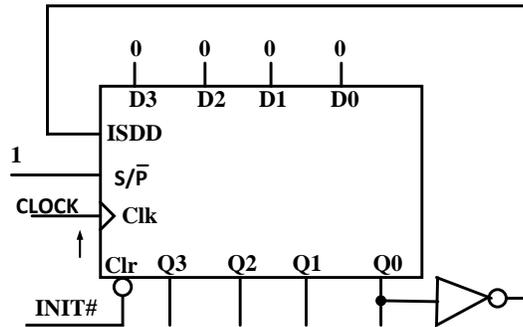d) $(I_0, I_1, I_2, I_3, I_4, I_5, I_6, I_7)$ = (1, 1, 0, 0, 1, 0, 0, 1) and (S_2, S_1, S_0) = (x, y, z)

29. The VEM map is given:

z \ xy	00	01	11	10
0	0	0	1	$\bar{u}$
1	u	1	1	u

The minimal form is:

a) $xy + yz + zu + x\bar{z}\bar{u}$

b) $xy + yz + \bar{x}zu$

c) $xyz + \bar{x}zu + x\bar{z}\bar{u}$

d) $\bar{y} + \bar{x}\bar{z} + zu + x\bar{z}\bar{u}$

30. What implements the circuit below that uses a right shift register

a) A 4-bit ring counter that shifts one bit 0
b) A 4-bit modulo 16 counter
c) A 4-bit Johnson counter
d) A 4-bit ring counter that shifts one bit 1

31. What is method overloading ?
a) An OOP feature where a method can have same name but different signature/declarations
b) An OOP feature where a method can have same signature/declarations but different implementation
c) An OOP feature to change a method declared in parent class.
d) An OOP feature to change a method declared in extended class.

32. What is the effect of using protected access modifier ?
a) the protected element can be accesed from outside the class
b) the protected element can be accesed only from curent class and derived classes
c) the protected element can be accesed only from current class
d) the protected element can be accesed only from derived class

33. What is a static member of a class ?
a) a static member is a class member that belongs only to the class instance
b) a static member is a class member that can be accesed only from outside the class instance
c) a static member is a class member that belongs to the class himself and not the a class instance
d) a static member is a class member that has specific value or implementation, depending of the class instance

34. What is the meaning of keyword "this" ?
a) a variable used inside a class to refer to the running program

b) a variable used inside a class to refer to the current object I'm working with
c) a variable used inside and outside a class to refer to the current object I'm working with
d) a variable used outside a class to refer to the class

35. What is method overriding ?
a) an OOP feature to refer method from extended class
b) an OOP feature that allows to change the implementation of a method declared in a derived class
c) an OOP feature that allows to access a method declared in a parent class
d) an OOP feature that allows to change the implementation of a method declared in a parent class

36. What is the effect of high frequency for process/threads context switching:
a) Low system efficiency in terms of system throughput (number of processes completed per time)
b) High system efficiency in terms of system throughput (number of processes completed per time)
c) The system is not affected by that.
d) Lower system interactivity.

37. What is the effect of high frequency for process/threads context switching:
a) Higher system interactivity.
b) High system efficiency in terms of system throughput (number of processes completed per time)
c) The system is not affected by that.
d) Lower system interactivity.

38. What is the role of clock interrupt in CPU scheduling.
a) Allow to preempt a process which is still runnable and allocate the CPU to another process.
b) No role.
c) Allocate the CPU to a process waiting for an IO operation.
d) We cannot have multithreading without clock interrupt.

39. Threads belonging to the same process:
a) Share the same data space (variables and heap).
b) Share the same stack.
c) Have nothing in common.
d) Each thread has a clone of data, the initial values are identical, but each assignment affects only the data from the thread local space.

40. How are system calls compared with regular function calls:
a)   More expensive.
b)   Identical.
c)   Have a special naming, all the system call names must start with "_".
d)   System calls must use Hungarian Notation.

41. Let $T(n)$ be the running time of an algorithm for input of size n. Let us assume that
$T(n)$ satisfies the following recurrence:
$$T(n) = \begin{cases} T_0 & \text{dacă } n = 1 \\ 2T(\lfloor n/2 \rfloor) + \log n & \text{dacă } n > 1 \end{cases}$$
Then the running time of the algorithm is:
a) $\Theta(n)$
b) $\Theta(n \log n)$
c) $\Theta(n^2)$
d) $\Theta(\log n)$.

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43. Let $T(n)$ be the running time of an algorithm for input of size n. Let us assume that
$T(n)$ satisfies the following recurrence:
$$T(n) = \begin{cases} T_0 & \text{dacă } n = 1 \\ T(\lfloor n/2 \rfloor) + n & \text{dacă } n > 1 \end{cases}$$
Then the running time of the algorithm is:
a) $\Theta(n)$
b) $\Theta(n \log n)$
c) $\Theta(n^2)$
d) $\Theta(\log n)$.

44. Ley us consider the following statements: i) $\log_2 n = O(3^n)$; ii) $\sqrt{n} = O(\log_2 n)$; iii)
$n^2 = O(1000 \cdot n \cdot \log_2 n)$; iv) $3^n = \Theta(2^{n+100})$. Which of the following statements is
true?

a) i) and ii) true, iii) and iv) false;
b) i) true, ii), iii) and iv) false;
c) i) and iv) true, ii) and iii) false;
d) ii), iii) and iv) true, i) false.

45. Let us consider the following algorithm that takes two natural numbers $m, n \in \mathbb{N}$ and returns one natural number:

ALG(m, n)
1. if $m = 0$ then
2.   return 1
3. else if $n = 0$ then
4.   return 1
5. else
6.   return ALG($m - 1, n$) + ALG($m, n - 1$)

Let us denote with x the number of additions, with y the number of calls to ALG (including initial call) and with z the returned value, for the call ALG(3,3). Which of the following statements is true?

a) $x = 19$, $y = 19$, $z = 20$;
b) $x = 10$, $y = 20$, $z = 30$;
c) $x = 14$, $y = 29$, $z = 15$;
d) $x = 19$, $y = 39$, $z = 20$.

46. What is a product backlog?
a) A list that sets out what has to be done to complete the product development
b) A list with all the features of the product that have to be completed within the current sprint
c) The set of requirements that have to be implemented during next sprint
d) A list with all the non-functional requirements for a product

47. Considering the Agile methodology a user story is:
a) A fine-grained narrative that sets out, in a structured way, a single thing that a user wants from a software system.
b) A narrative that describes how the user will access the features of the system
c) Describing what features of the software are accessible to the end users
d) A story providing information about how the user will interact with the system

48. In the context of software systems, system availability is referring to the:
a) Percentage of time when a system is up and running and available to deliver its services.
b) Fact that the system is accessible by its end users
c) Way that the system can be used by its end users
d) The time interval between which the system is available to its users

49. In software systems, the term scalability is referring to:
a) The fact that the system is provided with enough resources to handle all its users
b) The ability to cope with increasing demand without loss of service or performance;
c) The ability of the system to adjust its functionalities based on the load
d) How many resources are needed for a system to run

50. A Microservice refers to:
 a) A small scale software component which shares the data with other services of the
    ecosystem through a database
 b) A small-scale, stateless software component that is completely independent and
    which implements multiple business functions.
 c) A small-scale, stateless software component that is completely independent and
    which implements a single business function.
 d) A software

51. What is the output of the following program?
#define SQR(x) (x*x)
main()
{
int a, b = 3;
a = SQR(b+2);
printf("%d",a);
}
    a. 11
    b. 25
    c. error
    d. garbage value

52.   In the case of implicit addressing, the following is used but not specified:
a) the general register
b) the Accumulator register
c) the SP register
d) the Instruction register

53. Vector computers belong to the class:
a) SISD
b) SIMD
c) MISD
d) MIMD

54. Which of the following statements is CORECT about B trees?
   a) There is no relation between the number of child pointers in a B tree node and the
        number of keys from the node.
    b) Number of child pointers in a B tree node is always equal to number of keys in it.
    c) Number of child pointers in a B tree node is always equal to number of keys in it plus
        one.
    d) Number of child pointers in a B tree node is always equal to number of keys in it
        minus one.

55. Which of the following statements are CORECT about a minimal spanning tree (MST)?
   a) The MST may have a maximum of one cycle.
   b) The MST contains no cycles.
   c) The MST may have many cycles.
   d) There is no specific requirement about the number of cycles from the MST

56. The LIKE SQL keyword is used along with:
   a) GROUP BY clause
   b) WHERE clause
   c) ORDER BY clause
   d) JOIN CLAUSE

57. Which SQL statement is used to return only different values?
   a) SELECT UNIQUE
   b) SELECT IDENTITY
   c) SELECT DIFFERENT
   d) SELECT DISTINCT

58. What does the schematic below that uses the 74LS163A module implement?
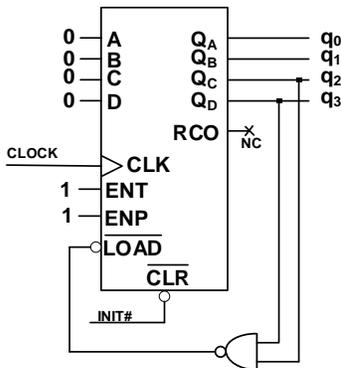
   a) A binary counter modulo 13
   b) A binary counter modulo 12
   c) A binary counter modulo 4
   d) A binary counter modulo 3

59. What does the state diagram in the following figure model?
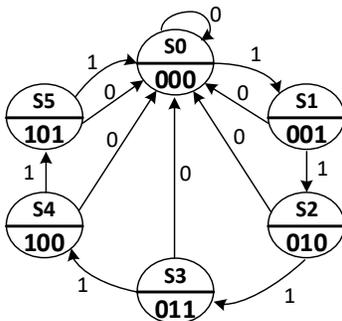
   a) A modulo 5 binary counter with synchronous clear on low level
   b) A modulo 6 binary counter with synchronous clear on high level
   c) A modulo 6 binary counter with synchronous clear on low level

d) A modulo 6 binary counter with synchronous locking on low level

60. What does the next code display on screen, after execution ?
```
class Test {
public:
   void printNr(int nr) { cout << "test nr=" << nr << " "; }
};
class BetterTest : public Test {
public:
   void printNr(int nr) { Test::printNr(nr); cout << "better test nr=" << nr; }
};
int main() {
   BetterTest* betterTest = new BetterTest();
   betterTest->printNr(10);
}
```
   a) Nothing. Execution error
   b) test nr=10 better test nr=11
   c) better test nr=11 test nr=10
   d) better test nr=10 test nr=11

61. What does the next code display on screen, after execution ?
```
class Test {
private: int nr;
public:
   Test(int nr = 10) { this->nr = nr;}
   Test* someMethod() { return new Test(this->nr+1); }
   void printNr() { cout << "nr=" << this->nr; }
};
int main() {
   Test* test = new Test();
   test->someMethod()->printNr();
}
```
   a) Nothing. Execution error
   b) nr=11
   c) nr=10
   d) nr=9

62. What is the result of printing the value of *I* variable after 4 threads will execute the following code concurrently:
```
pthread_mutex_t mutex = PTHREAD_MUTEX_INITIALIZER;
volatile int i; //i is shared by all threads
void* thread_code(void* args)
{
       pthread_mutex_lock(&mutex);
       for (int counter = 0; counter < 1000000; counter++)
              i++;
```

```
        pthread_mutex_unlock(&mutex);
}
```
    a) It will display 4000000.
    b) It could be any value between 1000000 and 4000000.
    c) It will display 10000000.
    d) It is impossible to use shared variables in threads.

63. What is the result of printing the value of *I* variable after one thread will execute
thread_code1 concurrently with another thread executing *thread_code2*:

```
pthread_mutex_t mutex1 = PTHREAD_MUTEX_INITIALIZER;
pthread_mutex_t mutex2 = PTHREAD_MUTEX_INITIALIZER;

volatile int i; //i is shared by all threads
void* thread_code1(void* args)
{
        pthread_mutex_lock(&mutex1);
        for (int counter = 0; counter < 1000000; counter++)
                i++;
        pthread_mutex_unlock(&mutex1);
}
void* thread_code2(void* args)
{
        pthread_mutex_lock(&mutex2);
        for (int counter = 0; counter < 1000000; counter++)
                i++;
        pthread_mutex_unlock(&mutex2);
}
```
   a) It will display 2000000.
    b) It could be any value between 1000000 and 2000000.
    c) It will display 10000000.
    d) It is impossible to use shared variables in threads.

64. Let us consider the following binary tree. Let us denote with PRE, $POST$ and IN its
traversals in preorder, postorder and inorder. Which of the following statements is true?

a) $PRE = 12,15,10,7,6,3,14$
$POST = 10,15,3,6,14,7,12$
$IN = 15,10,12,3,6,7,14$
b) $PRE = 10,15,3,6,14,7,12$
$POST = 12,15,10,7,6,3,14$
$IN = 15,10,12,3,6,7,14$
c) $PRE = 12,15,10,7,6,3,14$
$POST = 15,10,12,3,6,7,14$
$IN = 10,15,3,6,14,7,12$
d) $PRE = 15,10,12,3,6,7,14$
$POST = 10,15,3,6,14,7,12$
$IN = 12,15,10,7,6,3,14$
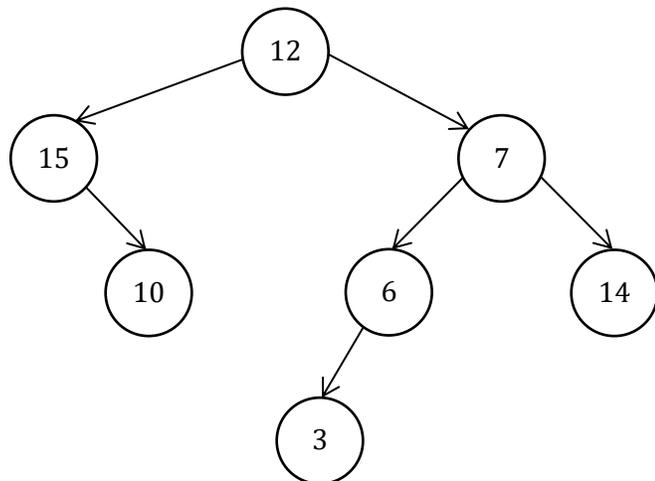
65. Let us consider a sequence of natural numbers $x = x_1, x_2, ..., x_n$ and a stack S, initially empty. At each step we execute one of the operations: we push the next element of the input sequence from left to right to the stack or we pop an element from the stack and we print it out. The process stops when the stack is empty and there are no more elements in the input sequence. The result obtained is printing out of a permutation of those n numbers of the input sequence. Let us consider the following permutations of sequence $x = 1,2,3,4$: $p_1 = 2,3,4,1$; $p_2 = 1,2,4,3$; $p_3 = 3,4,1,2$ and the statements: $P_i = "p_i$ can be obtained from x using the process based on the stack that is described in the problem statement", for each $i = 1,2,3$. Which of the following statements is true?
   a) P_1 true, P_2 true, P_3 true;
   b) P_1 false, P_2 false, P_3 false;
   c) P_1 true, P_2 true, P_3 false;
   d) P_1 false, P_2 true, P_3 false.

66. Which of the following is NOT a branching strategy:
   a) Pull Request
   b) Feature Branch
   c) Git Flow
   d) Fork