ALGO
MCQ

1. **In a binary tree, a node that has no child is?**
   (a) a root
   (b) an internal node
   (c) an external node
   (d) a leaf

2. **In a binary tree, the path obtained from the root by following just the left links is called ?**
   (a) the right path
   (b) the left edge
   (c) the left branch
   (d) the left metalink

3. **In a binary tree, a node that has just one right child is called ?**
   (a) a root
   (b) an internal node
   (c) a right external node
   (d) a right single internal node

4. **The size of a non empty binary tree is?**
   (a) $\geqslant -1$
   (b) $\geqslant 0$
   (c) $\geqslant 1$

5. **A proper binary tree is a binary tree in which ?**
   (a) every node is single
   (b) every level is completely filled except the last, which is filled from left to right
   (c) every node is double except at the last level
   (d) every node is double

ANNULÉ

6. **A binary tree whose nodes are all singles is?**
   (a) degenerate
   (b) complete
   (c) perfect
   (d) proper
   (e) filiform

7. **If EPL(B) is the external path length of a binary tree B, then EAD(B) (the external average depth of B) is equal to ?**

(a) EPL(B)/nl with nl the number of leaves of B
(b) EPL(B)/n with n the number of nodes of B
(c) EPL(B)/n with n the number of external nodes of B
(d) EPL(B).n with n the number of external nodes of B

8. **The binary tree B={E,0,1,00,01,000,001,0010,0011,00100,00101} is ?**

(a) degenerate
(b) complete
(c) perfect
(d) proper
(e) nothing in particular

9. **In the depth-first traversal of a binary tree, which orders are induced ?**

(a) Preorder
(b) Inorder
(c) Intermediate
(d) Postorder

10. **How many orders does the depth-first traversal of a binary tree induce ?**

(a) 1
(b) 2
(c) 2 and a half
(d) 3
(e) 4

MCQ 2

Monday, 5 February

Question 11

Let $P(X) = (X^2 + X)(X + 1)^2 \in \mathbb{R}[X]$. Then:

a. -1 is a root of P of multiplicity exactly 2

b. -1 is a root of P of multiplicity exactly 3

c. P admits two different roots in $\mathbb{R}$

d. None of the others

Question 12

Select the expressions below which are products of irreducible polynomials in $\mathbb{R}[X]$?

a. $X(X^2 + 1)$

b. $X(X^2 - 1)$

c. $X^2(X - 1)^3$

d. None of these expressions

Question 13

Let (E) : $xy' + 2y = 0$. The solutions of (E) on $]0, +\infty[$ are the functions of the form:

a. $x \longmapsto ke^{-2x}$ where $k \in \mathbb{R}$.

b. $x \longmapsto -kx^2$ where $k \in \mathbb{R}$.

c. $x \longmapsto \dfrac{k}{x^2}$ where $k \in \mathbb{R}$.

d. $x \longmapsto \dfrac{k}{x}$ where $k \in \mathbb{R}$.

e. None of the others

Question 14

Let (E) : $y'' + 2y' - 3y = x^2$ on $\mathbb{R}$. The solutions of the homogeneous equation associated to (E) are the functions of the form:

a. $x \longmapsto k_1 e^{-x} + k_2 e^{3x}$ where $(k_1, k_2) \in \mathbb{R}^2$.

b. $x \longmapsto k_1 e^{x} + k_2 e^{-3x}$ where $(k_1, k_2) \in \mathbb{R}^2$.

c. $x \longmapsto e^x\big(k_1 \cos(3x) + k_2 \sin(3x)\big)$ where $(k_1, k_2) \in \mathbb{R}^2$.

d. None of the others

Question 15

Let (E) : $y'' - y' + y = 3x^3 - 1$. To find a particular solution y_p of (E), we can search y_p as a polynomial

a. of degree 1

b. of degree 2

c. of degree 3

d. None of the others

Question 16

Let (E) : $y'' + y' + y = x + 1$.

a. The function $y : x \longmapsto x$ is a particular solution of (E)

b. The function $y : x \longmapsto x^2$ is a particular solution of (E)

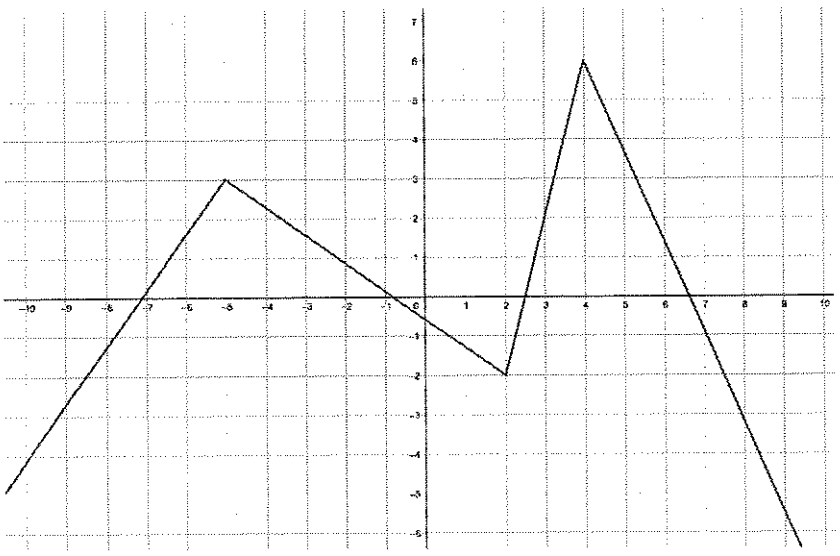
c. The function $y : x \longmapsto 2x$ is a particular solution of (E)

d. None of the others

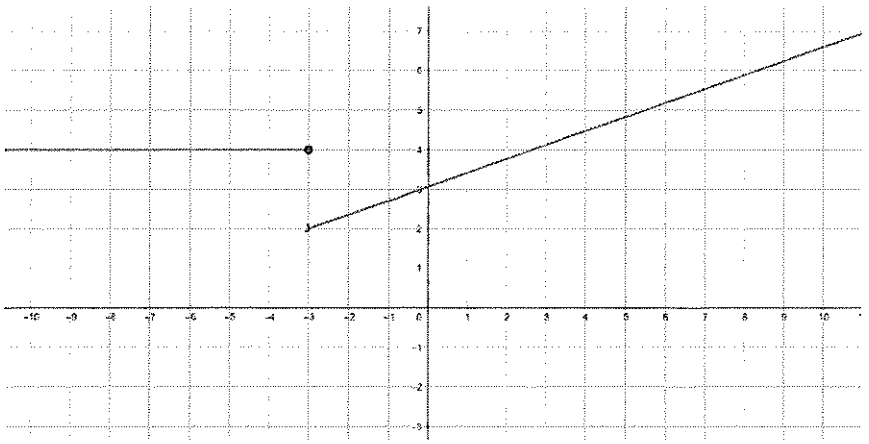
Question 17

Select the function(s) below which is(are) continuous on $[-8, 8]$?

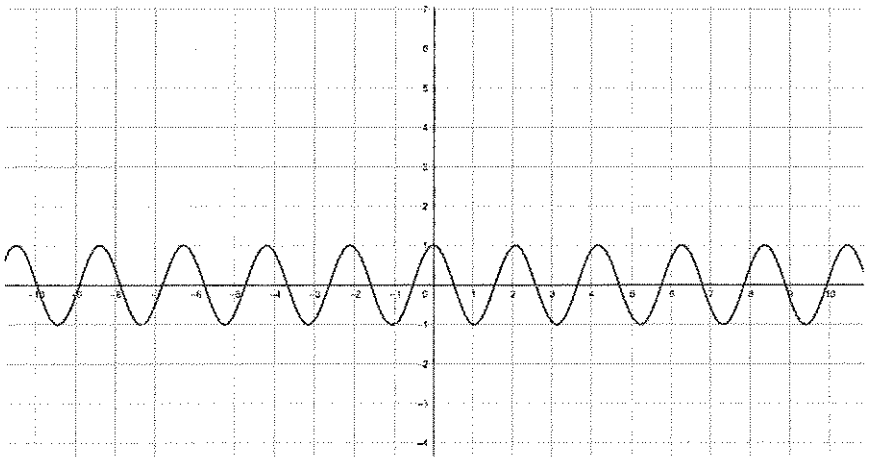
a.



b.



c.



d. None of these functions is continuous on $[-8, 8]$.

Question 18

Let the function f be defined and continuous on $\mathbb{R}$ such that $f(-2) = 4$ and $f(3) = -1$. Then:

a The equation $f(x) = 0$ admits at least one solution on $\mathbb{R}$.

b. The equation $f(x) = 0$ admits exactly one solution on $\mathbb{R}$.

c. We don't have enough information to know whether the equation $f(x) = 0$ admits at least one solution on $\mathbb{R}$.

Question 19

Consider a function f, infinitely differentiable on $\mathbb{R}$. The Taylor-Young's formula at the order 3 as x approaches 0 is:

a. $f(x) = f(0) + xf'(0) + x^2 f''(0) + x^3 f^{(3)}(0) + x^3\varepsilon(x)$ where $\lim\limits_{x\to 0} \varepsilon(x) = 0$.

b. $f(x) = f(0) + xf'(0) + \dfrac{x^2}{2} f''(0) + \dfrac{x^3}{3} f^{(3)}(0) + x^3\varepsilon(x)$ where $\lim\limits_{x\to 0} \varepsilon(x) = 0$.

c. $f(x) = f(0) + xf'(0) + \dfrac{x^2}{2!} f''(0) + \dfrac{x^3}{3!} f^{(3)}(0) + x^3\varepsilon(x)$ where $\lim\limits_{x\to 0} \varepsilon(x) = 0$.

d. None of the others

Question 20

Consider the function $f : x \longmapsto x^{10}$. The Taylor-Young's formula for f at the order 3 as x approaches 0 is:

a. $f(x) = 0 + x^3\varepsilon(x)$ where $\lim\limits_{x \to 0} \varepsilon(x) = 0$

b. $f(x) = 1 + 10x + 45x^2 + 120x^3 + x^3\varepsilon(x)$ where $\lim\limits_{x \to 0} \varepsilon(x) = 0$

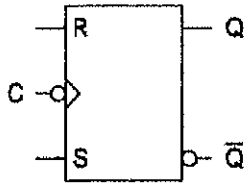
c. None of the others

Test 1
Computer Architecture

Monday 5 February 2024

For all the questions, one or more answers are possible.

21. What is the symbol below?



A. A master-slave RS flip-flop.
B. A negative-edge-triggered RS flip-flop.
C. A gated RS latch.
D. None of these answers.

22. An RS latch (R and S are active-high) can be made up of:
A. Two NAND gates.
B. Two EXCLUSIVE OR gates.
C. A NOR gate and a NAND gate.
D. Two NOR gates.

23. When both the R and S inputs of an active-high RS latch are zeros:
A. The output is inverted.
B. This state is forbidden.
C. The output does not change.
D. None of these answers.

24. When both the $\overline{R}$ and $\overline{S}$ inputs of a $\overline{RS}$ latch are zeros:
A. This state is forbidden.
B. The output does not change.
C. The output is inverted.
D. None of these answers.

25. A master-slave RS flip-flop:
A. Copies the R input into the Q output on each positive edge of the clock signal.
B. Can change the Q output on each positive edge of the clock signal only.
C. Can change the Q output on each negative edge of the clock signal only.
D. Can change the Q output on each positive edge and each negative edge of the clock signal.

26. A master-slave D flip-flop:
    A. Affects the Q output on each positive edge of the clock signal only.
    B. Affects the Q output on each negative edge of the clock signal only.
    C. Affects the Q output on each positive edge and each negative edge of the clock signal.
    D. None of these answers.

Let us consider the two following figures:

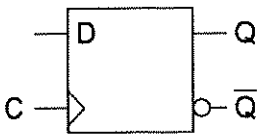


Figure 1

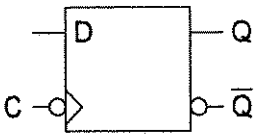


Figure 2

27. The symbol, shown in Figure 1, is:
    A. A master-slave D flip-flop.
    B. A gated D latch.
    C. A negative-edge-triggered D flip-flop.
    D. None of these answers.

28. The symbol, shown in Figure 2, is:
    A. A master-slave D flip-flop.
    B. A negative-edge-triggered D flip-flop.
    C. A gated D latch.
    D. None of these answers.

29. When both the J and K inputs of a negative-edge-triggered JK flip-flop are zeros:
    A. The output toggles (it is inverted).
    B. This state is forbidden.
    C. The output does not change.
    D. None of these answers.

30. When both the J and K inputs of a positive-edge-triggered JK flip-flop are ones:
    A. The output toggles (it is inverted).
    B. This state is forbidden.
    C. The output does not change.
    D. None of these answers.