ALGO
MCQ

1. **What is the size of an empty binary tree ?**

   (a) -1

   ✓ (b) 0

   (c) 1

2. **If PL(B) is the path length of a binary tree B, then AD(B) (the average depth of B) is equal to ?**

   (a) PL(B)/nl with nl the number of leaves of B

   ✓ (b) PL(B)/n with n the number of nodes of B

   (c) PL(B)/n with n the number of internal nodes of B

   (d) PL(B).n with n the number of internal nodes of B

3. **A tree whose nodes contain values is ?**

   (a) valued

   ✓ (b) labeled

   (c) valorisated

   (d) évaluated

4. **In a binary tree, a node that has 2 children is called ?**

   (a) a root

   ✓ (b) internal node

   (c) external node

   ✓ (d) double internal node

5. **In a binary tree, the path obtained from the root by following just the right links is called ?**

   (a) the right path

   ✓ (b) the right edge

   (c) the right branch

   (d) the right metalink

6. **In a binary tree, a node that has one left child is called ?**

   (a) a root

   ✓ (b) internal node

   (c) right external node

   ✓ (d) left single internal node

7. **The height of a binary tree that has only a root node is?**

   (a) -1

   ✓ (b) 0

   (c) 1

8. **A complete binary tree is a binary tree in which ?**

    (a) every level is completely filled
    (b) every level is completely filled except the last, which is filled from left to right ✓
    (c) every level is completely filled except the last, which is filled from right to left
    (d) every level is completely filled except the last, which is randomly filled

9. **A left comb is a ?**

    (a) complete binary tree
    (b) perfect binary tree
    (c) proper binary tree ✓
    (d) filiform binary tree

10. **The binary tree B={1,2,3,4,5,6,7,8,9,10,11,13} is ?**

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

MCQ 1

Monday, 29 January

Notation: for all $P \in \mathbb{R}[X]$, the degree of P is denoted by $\deg(P)$.

Question 11

In $\mathbb{R}[X]$, consider the polynomials: $P(X) = 2X^2 - X + 7$ and $Q(X) = X - 1$.

✓ a. The degree of $P(X) - Q(X)$ is equal to 2.

b. The degree of $P(X) - 2XQ(X)$ is equal to 2.

c. The degree of $P(X) \times Q(X)$ is equal to 2.

✓ d. The degree of $P(X) \times Q(X)$ is equal to 3.

e. None of the others

Question 12

In $\mathbb{R}[X]$, consider the polynomial P such that $P(X) = (X + 2)(X^5 + X^2 + 1) + X^2 + 1$. Then:

✓ a. The quotient of the euclidean division of P by $X^5 + X^2 + 1$ is equal to $X + 2$

b. The quotient of the euclidean division of P by $X + 2$ is equal $X^5 + X^2 + 1$

c. The remainder of the euclidean division of P by $X + 2$ is equal $X^2 + 1$

d. None of the others

Question 13

Let $(A, B) \in \left(\mathbb{R}[X]\right)^2$ with B non-zero. Two polynomials Q and R in $\mathbb{R}[X]$ are the quotient and the remainder of the euclidean division of A by B if and only if:

a. $A = BQ + R$

b. $A = BQ + R$ and $0 \le R \le |B|$

✓ c. $A = BQ + R$ and $\deg(R) < \deg(B)$

d. None of the others

Question 14

Let $P \in \mathbb{R}[X]$ such that -3 and 2 are roots of P.

Which of the propositions below is(are) possible for the polynomial P?

    a. $P(X) = 5(X - 3)(X + 2)$

    b. $P(X) = 4(X + 3)(X - 2)$

    c. $P(X) = 3(X - 2)(X - 4)$

    d. None of these propositions.

Question 15

Let $P(X) = (X - 1)^2(X^6 + 15X + 10) \in \mathbb{R}[X]$. Then:

    a. $P(1) = 0$

    b. $P'(1) = 0$

    c. $P''(1) = 0$

    d. None of the others

Question 16

Let $P(X) = (-1 - X)^2(X + 2)^4$.

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

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

    c. $(X + 2)(-1 - X)$ divides P

    d. None of the others

Question 17

Select the correct answer(s):

    a. The differential equation (E) : $y' + 2ty^2 = 3t$ is a linear equation of order 1.

    b. The differential equation (E) : $y' + 2ty = 3t$ is a linear equation of order 1.

    c. The differential equation (E) : $y' + 2ty = 3t$ is a linear homogeneous equation of order 1.

    d. None of the others

Question 18

Let (E) : $y' - 2y = 0$. The solution set of (E) on $\mathbb{R}$ is the set of the functions of the form:

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

   b. $t \longmapsto ke^{\frac{1}{2}t}$ where $k \in \mathbb{R}$.

   c. $t \longmapsto ke^{2t}$ where $k \in \mathbb{R}$.

   d. $t \longmapsto ke^{-\frac{1}{2}t}$ where $k \in \mathbb{R}$.

   e. None of the others

Question 19

Let (E) : $y' - 2y = 2$ on $\mathbb{R}$. Then:

   a. The function $y_p : t \longmapsto 0$ is a particular solution of (E).

   b. The function $y_p : t \longmapsto 1$ is a particular solution of (E).

   c. The function $y_p : t \longmapsto -1$ is a particular solution of (E).

   d. The function $y_p : t \longmapsto t$ is a particular solution of (E).

   e. None of the others

Question 20

Consider the function $y : t \longmapsto t + 1$. This function is a solution of the differential equation(s):

   a. (E) : $y' + y = 1$

   b. (E) : $y' + y = t + 2$

   c. (E) : $y' + y = t^2$

   d. None of these differential equations

21 – Quels critères définissent la cybersécurité
✓
    A) Disponibilité, Confidentialité, Intégrité, Traçabilité
    B) Disponibilité, Capacité, Intégrité, Traçabilité
    C) Disponibilité, Confidentialité, Informativité, Traçabilité

22 – Quelle part du PIB européen représente la cybercriminalité ?
    A) 0,1%
✓
    B) 1%
    C) 10%

23 – La 5G représente un nouvel enjeu
    A) Purement numérique
    B) De confort
✓
    C) Une révolution technologique et sociale

24 – La démographie croissante a un impact sur les enjeux de sécurité
    A) Parfois
    B) Jamais
✓
    C) Depuis toujours

25 – Combien dénombre-t-on de secteurs d'activité d'importance vitale ?
✓
    A) 12 (répartis en 4 dominantes)
    B) 12 (répartis en 6 dominantes)
    C) 16 (répartis en 4 dominantes)

26 – La cyber guerre
    A) Relève des récits de science-fiction
✓
    B) A déjà commencé
    C) Sera la seule forme de guerre dans 30 ans

27 – Le cyber terrorisme
    A) N'est apparu qu'une seule fois
    B) Concerne le prosélytisme sous toutes ses formes
✓
    C) Va au-delà du prosélytisme et peut prendre des formes complexes

28 – Les règles d'Asimov
    A) Concernent uniquement la robotique
✓
    B) S'appliquent à tout système d'Intelligence Artificielle
    C) Diffusées en 1942, sont désuètes

29 – A l'avenir
    A) Il y aura moins de crises et plus de technologie
    ✓ B) Les crises seront plus fréquentes
    C) Les crises seront moins impactantes

30 – La cybersécurité propose des métiers d'avenir
    A) En France uniquement
    ✓ B) Pour lesquels la flexibilité et la curiosité sont des atouts
    C) Qui ne demandent aucun investissement en sortie de formation