ALGO
QCM

1. Que l'ajout d'éléments se fasse en racine ou aux feuilles, l'arbre binaire de recherche obtenu est le même ?
   (a) Vrai
   (b) Faux

2. Lorsque l'on utilise l'ajout d'éléments en racine, l'arbre binaire de recherche résultant est systématiquement équilibré ?
   (a) Vrai
   (b) Faux

3. La recherche par interpolation linéaire nécessite une structure statique de liste ?
   (a) Vrai
   (b) Faux

4. La complexité au pire de la recherche négative par interpolation linéaire est d'ordre ?
   (a) linéaire
   (b) logarithmique
   (c) quadratique
   (d) constant

5. Les feuilles d'un ABR sont sur au plus deux niveaux ?
   (a) vrai
   (b) faux

6. Un arbre de recherche équilibré est systématiquement binaire ?
   (a) Vrai
   (b) Faux

7. Une rotation peut être ?
   (a) simple
   (b) double
   (c) triple

1

8. **Une rotation droite-droite est une rotation ?**
   (a) simple
   (b) double
   (c) triple
   (d) qui n'existe pas

9. **La complexité de la recherche positive d'un élément dans un A.B.R. se terminant sur un noeud v est ?**
   (a) 2*hauteur(v)+1
   (b) 2*hauteur(v)+2
   (c) hauteur(v)+1
   (d) hauteur(v)+2
   (e) Aucune des 4 propositions précédentes

10. **La hauteur d'un ABR peut être ?**
    (a) Une fonction quadratique de sa taille
    (b) Une fonction logarithmique de sa taille
    (c) Une fonction linéaire de sa taille
    (d) Une fonction exponentielle de sa taille

QCM N°21

lundi 16 avril 2018

Question 11

Soit f l'endomorphisme de $\mathbb{R}^2$ défini, pour tout $(x, y) \in \mathbb{R}^2$, par $f(x, y) = (2x+y, y-x)$. Alors, la matrice de f relativement à la base canonique de $\mathbb{R}^2$ est

a. $\begin{pmatrix} 2 & 1 \\ 1 & -1 \end{pmatrix}$

b. $\begin{pmatrix} 2 & 1 \\ -1 & 1 \end{pmatrix}$

c. $\begin{pmatrix} 2 & -1 \\ 1 & 1 \end{pmatrix}$

d. $\begin{pmatrix} 2 & -1 \\ 1 & -1 \end{pmatrix}$

e. rien de ce qui précède

Question 12

Soit $A = \begin{pmatrix} 1 & 1 \\ 3 & 4 \end{pmatrix}$. Alors, A^{-1} est égale à

a. $\begin{pmatrix} -1 & 4 \\ 1 & -3 \end{pmatrix}$

b. $\begin{pmatrix} 4 & 1 \\ 3 & 1 \end{pmatrix}$

c. $\begin{pmatrix} -4 & 1 \\ 3 & -1 \end{pmatrix}$

d. $\begin{pmatrix} 4 & -1 \\ -3 & 1 \end{pmatrix}$

e. rien de ce qui précède

Question 13

Soient A et B deux matrices réelles carrées d'ordre $n \in \mathbb{N}^*$. Alors

a. $\mathrm{tr}(AB) = \mathrm{tr}(A)\mathrm{tr}(B)$

b. si $AB = BA$, $\mathrm{tr}(AB) = \mathrm{tr}(A)\mathrm{tr}(B)$

c. $\mathrm{tr}(AB) = \mathrm{tr}(BA)$

d. $\mathrm{tr}(A + 2B) = \mathrm{tr}(A) + 2\,\mathrm{tr}(B)$

e. rien de ce qui précède

3

Question 14

Soient $f : \begin{cases} \mathbb{R}_2[X] & \longrightarrow \mathbb{R}_2[X] \\ P(X) & \longmapsto P'(X) \end{cases}$ et $\mathscr{B} = (1, X, X^2)$. Alors la matrice de f relativement à $\mathscr{B}$ est

a. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

b. $\begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 2 & 0 \end{pmatrix}$

c. $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{pmatrix}$

d. $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{pmatrix}$

e. rien de ce qui précède

Question 15

Soient A et B deux matrices réelles carrées d'ordre $n \in \mathbb{N}^*$ inversibles. Alors

a. $(AB)^{-1} = A^{-1}B^{-1}$

b. $(AB)^{-1} = B^{-1}A^{-1}$

c. AB n'est pas nécessairement inversible

d. $(A+B)^{-1} = A^{-1} + B^{-1}$

Question 16

a. L'application $f : \begin{cases} \mathbb{R}[X] & \longrightarrow \mathbb{R}[X] \\ P(X) & \longmapsto P(X)P'(X) \end{cases}$ est linéaire

b. L'application $f : \begin{cases} \mathbb{R}[X] & \longrightarrow \mathbb{R}[X] \\ P(X) & \longmapsto X^2P''(X) \end{cases}$ est linéaire

c. L'application $f : \begin{cases} \mathbb{R}^2 & \longrightarrow \mathbb{R}^2 \\ (x,y) & \longmapsto (x-y, 5x-3y) \end{cases}$ est linéaire

d. L'application $f : \begin{cases} \mathbb{R}^3 & \longrightarrow \mathbb{R}^3 \\ (x,y,z) & \longmapsto (xy-z, 5x-3y, z-x) \end{cases}$ est linéaire

e. rien de ce qui précède

4

Question 17

Soient E un $\mathbb{R}$-ev et $f \in \mathscr{L}(E)$. Alors

a. $f\big(\mathrm{Im}(f)\big) = \mathrm{Im}(f)$

b. $f\big(\mathrm{Ker}(f)\big) = \{0\}$

c. $f\big(\mathrm{Im}(f)\big) = E$

d. $f\big(\mathrm{Ker}(f)\big) = \mathrm{Ker}(f)$

e. rien de ce qui précède

Question 18

a. L'application $f : \begin{cases} \mathbb{R}[X] & \longrightarrow \mathbb{R}^2 \\ P(X) & \longmapsto \big(P(2), P'(1)\big) \end{cases}$ est linéaire

b. L'application $f : \begin{cases} \mathbb{R}[X] & \longrightarrow \mathbb{R}^2 \\ P(X) & \longmapsto \big(P(1)+P(2), P'(1)\big) \end{cases}$ est linéaire

c. L'application $f : \begin{cases} \mathbb{R}[X] & \longrightarrow \mathbb{R}^2 \\ P(X) & \longmapsto \big(P(1)P(2), P'(1)\big) \end{cases}$ est linéaire

d. L'application $f : \begin{cases} \mathbb{R}[X] & \longrightarrow \mathbb{R}^2 \\ P(X) & \longmapsto \big(P(1)+1, P'(1)\big) \end{cases}$ est linéaire

e. rien de ce qui précède

Question 19

a. L'ensemble des polynômes à coefficients réels, nuls ou de degré inférieur ou égal à 2017 est un $\mathbb{R}$-ev

b. L'ensemble des polynômes à coefficients réels multiples de $X-1$ est un $\mathbb{R}$-ev

c. L'ensemble des polynômes à coefficients réels dont le terme constant est nul est un $\mathbb{R}$-ev

d. L'ensemble des polynômes à coefficients réels positifs ou nuls est un $\mathbb{R}$-ev

e. rien de ce qui précède

Question 20

Soient E un $\mathbb{R}$-ev, F et G deux sev de E.

$E = F \oplus G$ signifie

a. $E = F \cup G$ et $F \cap G = \{0\}$

b. $E = F \cap G$ et $F \cup G = \{0\}$

c. $E = F \cup G$ et $F \cap G = \emptyset$

d. $E = F + G$ et $F \cap G = \{0\}$

e. rien de ce qui précède

5

1984 – Part 2, Chap. 7-10

21. *'Winston had woken up with his eyes full of tears.'* - Why?

A) Because he was in pain.

B) Because he hadn't slept well.

C) Because he had a dream that made him realise that he hadn't actually killed his mother.

D) Because he had a dream in which he was caught by Thought Police.

22. Among any things that Winston remembered about his childhood, one was ____.

A) how much richer they were.

B) his continuous hunger.

C) how beautiful his mother was.

D) how much better everything was.

23. *'Winston's heart was thumping so hard that he doubted whether he would be able to speak. They had done it at last, was all he could think.'* - What had they done?

A) They had met in secret.

B) They had drunk some wine.

C) They had joined the Brotherhood.

D) They had gone to meet O'Brien.

24. Who was Martin?

A) A servent of O'Brien.

B) A member of Thought Police.

C) A secret member of the Brotherhood.

D) Both A and C are correct.

25. The only thing that Julia did not agree to do as a member of Brotherhood was _____.

A) to commit murder.

B) to corrupt the minds of children.

C) to be separated from Winston.

D) to lose her identity.

26. What did O'Brien recommend to Winston?

A) Keeping the meeting a secret.

B) Reading Goldstein's book.

C) Never meeting him again.

D) None of the above.

27. What surprising thing happened at the middle of the Hate Speech?

A) It was announced that Oceania was actually at war with Eastasia and not Eurasia.

B) The orator left the platform in the middle of the speech.

C) Goldtein's face appeared.

D) People started screaming.

28. What is *Crimestop*?

A) It is a stop at the middle of a speech.

B) A Newspeak term meaning the ability to stop oneself from thinking a heretical thought.

C) A newspeak term meaning committing a crime.

D) None of the above.

29. What does Winston believe must be the final message of Goldstein's book?

A) That the future belongs to the Proles.

B) That there is no Big Brother.

C) That Ignorance is not Strength.

D) That Oceania was not at war with any country.

30. What does Winston realise about Mr. Charrington?

A) That he was a member of the Brotherhood.

B) That he was actually a member of the Thought Police.

C) That he was a friend of O'Brien.

D) That he was a spy.

Read the passage and answer the following questions

A number of scientists are emphasizing the tremendous challenges that will soon be posed when the depletion of fossil fuel supplies coincides with an alarming increase in the global population. They highlight agriculture, which is heavily dependent not only on gasoline to fuel machinery but also on the petrochemicals without which today's synthetic fertilizers and pesticides could not be manufactured. But for the latter two, crop yields would be only a fraction of what they are. To assume that an abundant source of renewable energy will be a panacea is to ignore these vital non-fuel uses of petrochemicals.

Then there is the challenge posed to the current levels of mobility. As a fuel, gasoline has an unrivalled portability compared to electricity, which requires bulky batteries, and hydrogen, which is notoriously difficult to store. Biofuels might seem like an alternative but the energy (currently in the form of fossil fuels) consumed when converting corn into bioethanol, for instance, greatly exceeds the output when the fuel is utilized. In any case, once the crisis in the food supply looms large it will not make sense to divert food crops to other uses.

Although there seems to be a general acceptance that an era is coming to an end, there is a widespread complacency resting on the assumption that the experts will come up with a technological remedy making for a completely pain-free transition. Scientists such as Walter Youngquist argue that this assumption may be mistaken and that the remaining resources might only support half of the current global population. In his opinion, the absence of a realistic alternative to fossil fuels will mean, amongst other things, that the first priority will be to curb the demand for food.

31. The passage implies that in the future
    a. the ease of travel will diminish.
    b. small farms will disappear.
    c. hydrogen will be the best substitute for gasoline.
    d. agricultural yields will continue to increase.

32. The aim of the passage is to
    a. describe realistic alternatives to fossil fuels.
    b. criticize scientists who are pessimistic.
    c. highlight the seriousness of the situation.
    d. outline a pain-free transition to a new era.

33. According to the passage, all the current alternatives to gasoline
    a. can supply more energy.
    b. will be much better for the environment.
    c. are less convenient.
    d. will have an adverse impact on agriculture.

34. According to Walter Youngquist, our most important step will be to
    a. reduce the birth rate globally.
    b. boost agricultural yields.
    c. find new synthetic fertilizers.
    d. protect our fossil fuel reserves.

35. The passage states that the general population
    a. consume more than they really need.
    b. assume that things will continue to get better.
    c. are becoming increasingly concerned about the future.
    d. do not realize that fossil fuels supplies are being depleted.

Read this new passage and answer the questions following it.

Genetically modified (GM) crops that exterminate pests feeding on them are no longer uncommon. One of the latest is a strain of corn genetically engineered to disrupt the expression of certain genes in the corn rootworm - a pest that devastate this important crop. This is the first time that the technique known as RNA interference has proven effective through the ingestion of RNA rather than through its injection into pests. Compared to the insect-resistant transgenic plants that produce the Bacillus thuringiensis (Bt) toxin, the new strain of corn is much more specific in that it targets genes only found in a small number of species. As regards the risk to humans, the companies promoting the new crop make the dubious claim that there is no cause for concern since the RNA is broken down in the normal process of human digestion. At the very least, there is the concern about a repetition of the unpleasant allergic reactions caused by some earlier GM varieties.

However, in the sphere of agriculture some experts are concerned that crops like this will show the same diminution in effectiveness observed with earlier Bt varieties. The chances of pests evolving to have a resistance to a toxin are greater when exposure occurs over a wider area for a longer period of time. By contrast, spraying with a pesticide only when absolutely necessary keeps the likelihood of toxin-resitant insects evolving down to a minimum. It would also be better for farmers to alternate pest management techniques instead of relying on one supposedly permanent solution. A further consideration is the diversity of the crop strains farmers plant. This suffers when powerful marketing campaigns persuade farmers to grow the same GM crop over huge areas.

36. According to the passage, RNA interference
    a. can prove fatal for an organism.
    b. only occurs in the corn rootworm.
    c. requires the injection of a chemical agent.
    d. is caused by the Bt toxin.

37. Which of the following does NOT make it more likely for pest populations to develop a resistance to toxins?
    a. the occasional use of pesticide sprays
    b. having the toxin permanently present in the crop
    c. relying on a single pest management technique
    d. using a pesticide over a wider area

38. The toxin in the new strain of GM corn
    a. is known to be effective against a wide range of pests.
    b. is also known as the Bt toxin.
    c. has caused allergic reactions in some humans.
    d. is not destroyed by corn rootworm digestion.

39. The passage implies that
    a. in some areas the new GM corn is now ineffective.
    b. corn rootworm cannot develop a resistance to RNA interference.
    c. very few farmers agreed to grow GM crops.
    d. the Bt toxin affects a range of pests.

40. In the opinion of the author, the companies marketing the new corn
    a. may have made a misleading statement.
    b. hold the key to solving the problem of hunger.
    c. are ignorant of alternative pest management techniques.
    d. have been unfairly targetted by anti-GM campaigners.

EPITA-S2
2017/2018

Q.C.M n°15 de Physique

41- La fonction d'état enthalpie est définie par $H = U + P.V$, la différentielle de cette fonction s'écrit lors d'une transformation adiabatique comme

a) $dH = V.dP + P.dV$
b) $dH = PdV$
c) $dH = V.dP$
d) $dH = V.dP - P.dV$

42- Les températures et les volumes dans une transformation **isobare** de l'état (1) vers l'état (2) d'un gaz parfait vérifient

a) $T.V =$ constante b) $\frac{V_1}{T_2} = \frac{T_1}{V_2}$ c) $T_1.V_1 = T_2V_2$ d) $T_1.V_2 = T_2V_1$

43- Lorsqu'un système fermé (gaz parfait) subit une transformation **isotherme**, la quantité de chaleur échangée avec le milieu extérieur est

a) $Q = W$ b) $Q = \Delta U$ c) $Q = -W$ d) $Q = 0$

44- Le travail des forces de pression de l'état (1) vers l'état (2) pour une transformation **isobare** est :

a) nul

b) $W = -P(V_2 - V_1)$

c) $W = -nRT\ln\left(\frac{V_2}{V_1}\right)$

45- Le travail des forces de pression de l'état (1) vers l'état (2) pour une transformation **isotherme** de température T est

a) $W = -n.R.T\ln\left(\frac{V_2}{V_1}\right)$ c) $W = -nRT(V_2 - V_1)$

b) $W = n.R.T\ln\left(\frac{V_2}{V_1}\right)$ d) nul

46- Lors d'un cycle la variation d'énergie interne vérifie :

a) $\Delta U > 0$ b) $\Delta U < 0$ c) $\Delta U = 0$

A. Zellagui

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47-Lors d'une transformation **isochore** d'un gaz parfait, la quantité de chaleur échangée avec le milieu extérieur est

a) $Q = W$ b) $Q = \Delta U$ c) $Q = -W$ d) $Q = 0$

T

48- La loi de Meyer et la définition du coefficient de Laplace permettent d'écrire les capacités thermiques molaires d'un gaz parfait sous la forme

a) $\begin{cases} c_V = \dfrac{R}{\gamma + 1} \\ c_p = \dfrac{\gamma . R}{\gamma + 1} \end{cases}$ b) $\begin{cases} c_V = \dfrac{R}{1 - \gamma} \\ c_p = \dfrac{\gamma . R}{1 - \gamma} \end{cases}$ c) $\begin{cases} c_V = \dfrac{\gamma . R}{\gamma - 1} \\ c_p = \dfrac{R}{\gamma - 1} \end{cases}$ d) $\begin{cases} c_V = \dfrac{R}{\gamma - 1} \\ c_p = \dfrac{\gamma . R}{\gamma - 1} \end{cases}$

49- Un gaz parfait subit une transformation adiabatique de l'état (1) de variables (P_1,V_1) vers l'état (2) de grandeurs (P_2,V_2). Le volume V_2 vérifie alors :

a) $V_2 = V_1 . \left(\dfrac{P_2}{P_1} \right)^{1/\gamma}$ b) $V_2 = V_1 . \left(\dfrac{P_1}{P_2} \right)^{1/\gamma}$ c) $V_2 = V_1 . \left(\dfrac{P_2}{P_1} \right)^{-\gamma}$ d) $V_2 = \gamma . V_1$

γ : représente le coefficient de Laplace

50- La loi de Laplace écrite en fonction de la température et le volume d'un gaz parfait donne

a) $T . V^{\gamma - 1} = C$ b) $T^{\gamma - 1} . V = C$ c) $T^{\gamma} . V = C$ d) $T . V^{\gamma + 1} = C$

(''C'' étant une constante)

QCM – Electronique

Pensez à bien lire les questions ET les réponses proposées (attention à la numérotation des réponses)

Soit un filtre du 1er ordre. On note $\underline{T}(\omega)$ la fonction de transfert d'un filtre, $A(\omega)$, son amplification et $G(\omega)$, son gain en dB.

Q1. $A(\omega)$ est le quotient de la tension efficace de sortie sur la tension efficace d'entrée.

a. VRAI
b. FAUX

Q2. $arg(\underline{T}(\omega))$ représente le déphasage de la tension d'entrée par rapport à la tension de sortie.

a. VRAI
b. FAUX

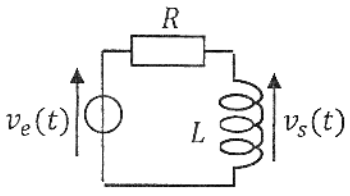
Q3. La fréquence de coupure est la fréquence pour laquelle :

a. $G = -3\ dB$
b. $G = G_{Max} + 3\ dB$
c. $G = \frac{G_{Max}}{\sqrt{2}}$
d. $A = \frac{A_{Max}}{\sqrt{2}}$

Q4. Quelle fonction représente la fonction de transfert d'un filtre passe-haut du 1er ordre?

a. $\underline{T}(\omega) = A_{Max}.\left(1 + \frac{j\omega}{\omega_c}\right)$
b. $\underline{T}(\omega) = A_{Max}.\frac{\frac{j\omega}{\omega_c}}{\left(1+\frac{j\omega}{\omega_c}\right)}$
c. $\underline{T}(\omega) = A_{Max}.\frac{\left(1+\frac{j\omega}{\omega_c}\right)}{\frac{j\omega}{\omega_c}}$
d. $\underline{T}(\omega) = A_{Max}.\frac{1}{\left(1+\frac{j\omega}{\omega_c}\right)}$

Soit le circuit ci-contre, où $v_e(t) = V_E.\sqrt{2}\,sin(\omega t)$ (Q5 à 7) :



Q5. De quel type de filtre s'agit-il? ?

a. Passe-Bas
b. Passe-Haut
c. Passe-Bande
d. Coupe-Bande

Q6. Quel type de filtre obtient-on si on remplace la bobine par un condensateur ?

a. Passe-Bas
b. Passe-Haut
c. Passe-Bande
d. Coupe-Bande

12

By Hyperion

Q7. Quelle est l'expression de sa fonction de transfert ?

a. $\underline{T}(\omega) = \frac{R}{R+jL\omega}$

b. $\underline{T}(\omega) = \frac{1}{R+jL\omega}$

c. $\underline{T}(\omega) = \frac{jL\omega}{R+jL\omega}$

d. $\underline{T}(\omega) = \frac{jL\omega}{1+jRL\omega}$

Q8. Quelle est sa pulsation de coupure ?

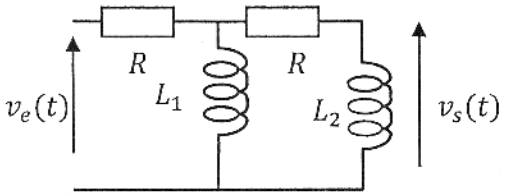
a. $\omega_c = \frac{1}{\sqrt{2}}$

b. $\omega_c = RL$

c. $\omega_c = \frac{L}{R}$

d. $\omega_c = \frac{R}{L}$

Soit le filtre ci-contre (Q9&10):



Q9. De quel type de filtre s'agit-il? ?

a. Passe-Bas b. Passe-Haut c. Passe-Bande d. Coupe-Bande

Q10. Quel type de filtre obtient-on si on remplace la bobine L_1 par un condensateur ?

a. Passe-Bas b. Passe-Haut c. Passe-Bande d. Coupe-Bande

QCM 7
Architecture des ordinateurs

Lundi 16 avril 2018

11. Quelle valeur peut-être codée sur n bits signés ?
    A. 2^n
    B. -2^{n-1}
    C. $2^n - 1$
    D. $-2^{n-1} - 1$

12. $1000110100_2 =$
    A. $10001101_2 \times 2^{-2}$
    B. $100011_2 \times 16$
    C. $10001101000000_2 \times 2^{-4}$
    D. $100011010000_2 \times 2^2$

13. Donnez la représentation IEEE 754, en simple précision, du nombre suivant : **-120,25**
    A. 11000010101000001000000000000000
    B. 11000010001000001000000000000000
    C. 11000010011100001000000000000000
    D. 11000010111100001000000000000000

14. Donnez la représentation décimale associée au codage IEEE 754 suivant : **4044 4000 0000 0000**$_{16}$
    A. 40
    B. 20
    C. 40,5
    D. 20,25

15. En double précision, quelle est la valeur maximum du champ ***E*** pour un codage à mantisse normalisée ?
    A. 1 023
    B. 1 024
    C. 2 047
    D. 2 046

14

Soit les deux figures ci-dessous :

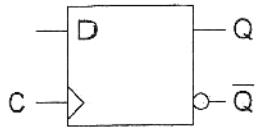


Figure 1

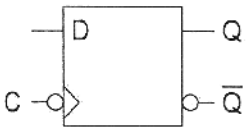


Figure 2

16. Soit la figure 1. Si $D = \overline{Q}$:
    A. La sortie ne change jamais.
    B. La sortie est toujours à 1.
    C. Aucune de ces réponses.
    D. La sortie bascule à chaque front montant du signal d'horloge.

17. Soit la figure 2. Si $D = \overline{Q}$:
    A. Aucune de ces réponses.
    B. La sortie ne change jamais.
    C. La sortie bascule à chaque front montant du signal d'horloge.
    D. La sortie est toujours à 1.

18. Un compteur comportant n bascules :
    A. Peut compter de 0 à 2^n.
    B. Ne peut pas compter de 0 à $2^n - 1$.
    C. Compte toujours de 0 à $2^n - 1$.
    D. Peut compter de 0 à $2^n - 1$.

19. Pour réaliser un compteur asynchrone modulo m sur n bits à cycle incomplet (avec $n > 2$), on doit :
    A. Détecter m - 1.
    B. Détecter 2^n - 1.
    C. Détecter 0.
    D. Détecter m.

20. Pour réaliser un décompteur asynchrone modulo m sur n bits à cycle incomplet (avec $n > 2$), on doit :
    A. Forcer 0.
    B. Forcer 2^n - 1.
    C. Forcer m.
    D. Forcer m - 1.

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