ALGO
MCQ

Consider the binary tree AB:

$$< A, < B, \emptyset, < D, < G, \emptyset, \emptyset >, < H, \emptyset, \emptyset >>>, < C, < E, \emptyset, < I, < K, \emptyset, \emptyset >, \emptyset >>, < F, \emptyset, < J, \emptyset, \emptyset >>>>$$

Where the letters are the nodes and where $\emptyset = emptytree$

1. **AB is a binary tree ?**
   - (a) degenerate
   - (b) complete
   - (c) perfect
   - (d) proper
   - (e) nothing in particular

2. **The height of the tree AB is ?**
   - (a) 2
   - (b) 3
   - (c) 4
   - (d) 5
   - (e) 6

3. **The internal and external path lengths of AB are equal to ?**
   - (a) $10, 14$
   - (b) $11, 13$
   - (c) $12, 12$
   - (d) $14, 10$
   - (e) $15, 9$

4. **The external average depth of AB is equal to ?**
   - (a) 0.72
   - (b) 1.50
   - (c) 2.18
   - (d) 3.25
   - (e) 4

5. **Using the characters representing the nodes of the tree AB, its inorder traversal is ?**
   - (a) $B, G, D, H, A, E, K, I, C, F, J$
   - (b) $A, B, D, G, H, C, E, I, K, F, J$
   - (c) $G, H, D, B, K, I, E, J, F, C, A$
   - (d) $A, B, C, D, E, F, G, H, I, J, K$

6. **Using the hierarchical numbering representation, the tree AB is ?**
   - (a) $1, 2, 3, 5, 6, 7, 10, 11, 13, 15, 26$
   - (b) $1, 2, 3, 5, 6, 7, 10, 11, 12, 15, 16$
   - (c) $1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12$
   - (d) $1, 2, 3, 4, 5, 6, 10, 11, 13, 15, 26$

Consider the general tree AG:

$$< A, < B, < E, < L, \emptyset >, < M, \emptyset >>, < F, \emptyset >, < G, < N, \emptyset >, < O, \emptyset >>,$$
$$< H, \emptyset >>, < C, < I, \emptyset >>, < D, < J, < P, \emptyset >, < Q, \emptyset >>, < K, \emptyset >>>$$

Where the letters are the nodes and where $\emptyset = emptyforest$

7. **The height of the tree AG is ?**
   - (a) 2
   - (b) 3
   - (c) 4
   - (d) 5
   - (e) 6

8. **The size of the tree AG is ?**
   - (a) 11
   - (b) 13
   - (c) 15
   - (d) 17
   - (e) 19

9. **Let BAG be the binary tree obtained using the *leftmostchild-rightsibling* memory representation of the tree AG, the heigth of BAG is ?**
   - (a) 2
   - (b) 3
   - (c) 4
   - (d) 5
   - (e) 6

10. **Let BAG be the binary tree obtained using the *leftmostchild-rightsibling* memory representation of the tree AG, the left edge of BAG is ?**
    - (a) (A,B,L,E)
    - (b) (A,L,B,E)
    - (c) (A,B,E,L)
    - (d) (B,A,L,E)
    - (e) (B,E,L,A)

MCQ 4

Monday, 19 February

Question 11

In the vector space $E = \mathbb{R}^2$, when substracting two elements of E, we get:

a. a real number

b. an element of E

c. a real number or an element of E, both results are possible.

Question 12

Let E be a set different from $\mathbb{R}$. In the property: "E is a vector space over $\mathbb{R}$", the term "over $\mathbb{R}$" means that:

a. the vectors are elements of $\mathbb{R}$

b. the scalars are elements of $\mathbb{R}$

c. the zero-vector of E is an element of $\mathbb{R}$.

d. None of the others

Question 13

Let E be a vector space over $\mathbb{R}$. Then we know that:

a. $\forall (u, v) \in E^2$, $u + v \in E$

b. $\forall (u, v) \in E^2$, $u + v \in \mathbb{R}$

c. $\forall (\lambda, u) \in \mathbb{R} \times E$, $\lambda.u \in E$

d. $\forall (\lambda, u) \in \mathbb{R} \times E$, $\lambda.u \in \mathbb{R}$

e. None of the others

Question 14

Consider the two $\mathbb{R}$-vector spaces $E = \mathbb{R}^2$ and $F = \mathbb{R}^3$. Then:

a. The zero-vector of E is the same as the zero-vector of F.

b. The zero-vector of E is $0_E = (0, 0)$

c. None of the others

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Question 15

Consider the set E of all the increasing numerical sequences. Let (u_n) and (v_n) be two elements of E. Then:

a. $(u_n) + (v_n) \in E$

b. $-1.(u_n) \in E$

c. E is a vector space over $\mathbb{R}$

d. None of the others

Question 16

Consider the set $E = \{aX + b,\ (a, b) \in \mathbb{R}^2\}$ (the set of all the polynomials of degrees $\leqslant 1$ with coefficients in $\mathbb{R}$). Let $(P, Q) \in E^2$. Then:

a. $P + Q \in E$

b. $\forall \lambda \in \mathbb{R},\ \lambda.P \in E$

c. None of the others

Question 17

Consider the set $E = \{(x, y, z) \in \mathbb{R}^3,\ y = -x\}$. Then:

a. $E \subset \mathbb{R}^2$

b. $E \subset \mathbb{R}^3$

c. $(1, -1) \in E$

d. $(1, -2, 3) \in E$

e. None of the others

Question 18

Let $u = (3, 2) \in \mathbb{R}^2$ and $v = (1, -2) \in \mathbb{R}^2$. Then:

a. $u + v = (4, 0)$

b. $-2.u = (-6, 2)$

c. $u - v = (2, 0)$

d. None of the others

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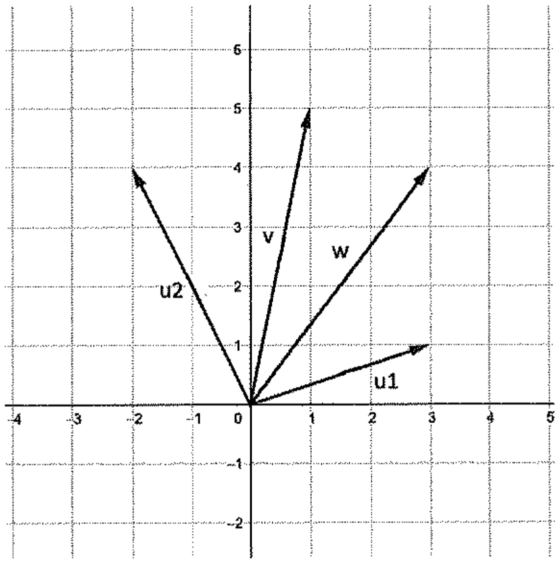
Question 19

In the plane, consider the 4 vectors u_1, u_2, v and w represented below.



Then:

a. $v = u_1 + u_2$

b. $w = u_1 + u_2$

c. None of the others

Question 20

The set of all the functions from $\mathbb{R}$ to $\mathbb{R}$ which are strictly increasing is a vector space over $\mathbb{R}$.

a. True

b. False

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