ALGO
MCQ

Consider the binary tree $B = \{E, 0, 1, 00, 01, 10, 11, 010, 011, 110, 111, 0100, 0101, 1100, 1101\}$

1. **B is a binary tree ?**
   (a) degenerate
   (b) complete
   (c) perfect
   (d) proper
   (e) filiform

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

3. **The external path length of B is equal to ?**
   (a) 15
   (b) 18
   (c) 21
   (d) 24
   (e) 27

4. **The external average depth of B is equal to ?**
   (a) 1
   (b) 1.78
   (c) 2.5
   (d) 3
   (e) 4

5. **Using the hierarchical numbering representation of the tree B, its preorder traversal is ?**
   (a) $4, 2, 20, 10, 21, 5, 11, 1, 6, 3, 28, 14, 29, 7, 15$
   (b) $4, 20, 21, 10, 11, 5, 2, 6, 28, 29, 14, 15, 7, 3, 1$
   (c) $1, 2, 4, 5, 10, 20, 21, 11, 3, 6, 7, 14, 28, 29, 15$
   (d) $1, 2, 3, 4, 5, 6, 7, 10, 11, 14, 15, 20, 21, 28, 29$

6. **Using the hierarchical numbering representation of the tree B, its inorder traversal is ?**
   (a) $4, 2, 20, 10, 21, 5, 11, 1, 6, 3, 28, 14, 29, 7, 15$
   (b) $4, 20, 21, 10, 11, 5, 2, 6, 28, 29, 14, 15, 7, 3, 1$
   (c) $1, 2, 4, 5, 10, 20, 21, 11, 3, 6, 7, 14, 28, 29, 15$
   (d) $1, 2, 3, 4, 5, 6, 7, 10, 11, 14, 15, 20, 21, 28, 29$

7. **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 internal nodes of B
   (b) PL(B)/n with n the number of nodes of B
   (c) PL(B)/n with n the number of external nodes of B
   (d) PL(B).n with n the number of external nodes of B

8. **The binary tree B={E,0,1,00,01,11,000,001,0010,0011,00100,00101} is ?**

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

9. **A complete 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

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 3

Monday, 12 February

Question 11

Let f be a function such that, as x approaches 0, $f(x) = o(x^2)$. Then as x approaches 0:

a. $f(x) = o(x)$

b. $f(x) = o(x^3)$

c. $xf(x) = o(x^2)$

d. $xf(x) = o(x^3)$

e. None of the others

Question 12

Consider the function $f : x \longmapsto 2x^2 + x$. Then:

a. As x approaches $+\infty$, $f(x) \sim x^2$

b. As x approaches $+\infty$, $f(x) \sim x$

c. As x approaches 0, $f(x) \sim x^2$

d. As x approaches 0, $f(x) \sim 0$

e. None of the others

Question 13

Consider a function f, infinitely differentiable on $\mathbb{R}$, admitting the following Taylor expansion in 0:

$$f(x) = 1 + x^2 + x^4 + x^5\varepsilon(x) \text{ where } \lim_{x \to 0} \varepsilon(x) = 0$$

a. This Taylor expansion is at the order 4.

b. This Taylor expansion is at the order 5.

c. $f(0) = 0$

d. $f'(0) = 1$

e. None of the others

Question 14

As x approaches 0:

a. $e^x = 1 - x + \frac{x^2}{2} - \frac{x^3}{3} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

b. $e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

c. $e^x = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

✓ d. $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

e. None of the others

Question 15

As x approaches 0:

a. $\sin(x) = 1 - \frac{x^2}{2!} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

b. $\sin(x) = x - \frac{x^2}{2!} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

✓ c. $\sin(x) = x - \frac{x^3}{3!} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

d. $\sin(x) = 1 + x - \frac{x^3}{3!} + x^3\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

e. None of the others

Question 16

As x approaches 0:

a. $\frac{1}{\sqrt{1+x}} = 1 + \frac{1}{2}x - \frac{1}{8}x^2 + x^2\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

✓ b. $\frac{1}{\sqrt{1+x}} = 1 - \frac{1}{2}x + \frac{3}{8}x^2 + x^2\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

c. $\frac{1}{\sqrt{1+x}} = 1 - \frac{1}{4}x + x^2\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

d. $\frac{1}{\sqrt{1+x}} = 1 - \frac{1}{2}x - \frac{1}{4}x^2 + x^2\varepsilon(x)$ where $\lim_{x\to 0} \varepsilon(x) = 0$.

e. None of the others

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Question 17

As x approaches 0, $e^x = 1 + x$.

a. True

✓ b. False

Question 18

Consider a function f, infinitely differentiable on $\mathbb{R}$. The Taylor-Young 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 19

Let (E) : $y'' - 2y' + 10y = x^2$ 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. $x \longmapsto e^x (k_1 \cos(3x) + k_2 \sin(3x))$ where $(k_1, k_2) \in \mathbb{R}^2$.

d. None of the others

Question 20

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

✓ a. $P(-1) = 0$

✓ b. $P'(-1) = 0$

✓ c. $P''(-1) = 0$

d. $P^{(3)}(-1) = 0$

e. None of the others

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ADP MCQ S2-B3

Grammar

Choose the correct alternative :

21. David likes to listen to music. Over the last two years, he _____ many songs on his phone.

A) downloaded
B) has download
C) has downloaded
D) downloads

22. The apartment manager _____ us about the meeting, but we weren't able to attend.

A) had told
B) has told
C) told
D) had been telling

23. I _____ to Asia, but I would like to visit.

A) had never been
B) went
C) have not been going
D) have never been

24. When I _____ my lunch, I went back to the library.

A) finish
B) will finish
C) had finished
D) have finished

25. The concert _____ when the power went off.

A) had just begun
B) has just began
C) was begun
D) began

26. José _____ at the computer for two hours. His eyes are tired.

A) sat
B) had sat
C) has been sitting
D) had been sitting

TOEIC

Questions 27-30 refer to the following article :

KOREA POST : Business Travelers Feel the Stress

New studies have shown that business travelers are more likely to suffer from heart failure, high blood pressure, and arthritis than those who only travel for pleasure. **(27)** _____.

Besides being cramped for long periods of time in airplanes, buses and taxis, business travelers often experience tense muscles and are more subject to back spasms and blood clots than those who don't travel often. In addition, business travelers rarely get a good night's sleep.

Dr. Ky-Yung Hwang of the Busan Sleep Lab says that people **(28)** _____ always travel with their own pillow. 'If business travelers can bring their laptops on board, there's no reason why they can't bring their own pillow,' said Dr. Ky-Yung in a recent radio interview. An even **(29)** _____ solution, according to celebrity doctor Dr. Kim-He Gun, from the hit television series *Ask the Specialist*, is to avoid business travel altogether.

The studies have also shown that time away from families can be detrimental to family life. After all, everything from **(30)** _____ meals to driving kids to and from school is affected when one parent goes away on business.

27. Which of the following best suits in the blank ?
    A) Heart attacks are another concern.
    B) The good news is that pleasure travel is becoming increasingly popular.
    C) While business travelers tend to suffer, the elderly are also at risk.
✓ D) The major cause of these symptoms is prolonged exposure to tight spaces.

28. A) might
    B) will
✓ C) should
    D) can't

29. A) good
    B) the best
✓ C) better
    D) greatest

30. A) preparation
    B) prepared
✓ C) preparing
    D) prepare