Final Examination   تخلفات
Discrete Mathematics BS - 103

الامتحان يقع في ورقة من صفحتين.

First Question (10- Marks)

Choose the appropriate signs "✓" or "×" for the following:

[1]   The general term of the sequence: 5, 0.5, 0.05, … is of the form: (5×10^{-n}) for $n \geq 0$ (........)

[2]   A simple path is a path with no repeated vertices.   (.........)

[3]   The degree of a vertex in an in-directed graph is the number of edges incident with it.   (.........)

[4]   The day of the week will it be after 200 days from Monday is Friday.   (.........)

[5]   A tree with 5 −vertices has exactly 5 edges   (... ... ...)

[6]   The general term of the sequence: 2, 0.2, 0.02, … is (2×10^{-n}) for $n \geq 0$ (... ... ...)

[7] $\displaystyle\sum_{k=1}^{n} a_{n-k} = \sum_{k=0}^{k=n-1} a_{n-k-1}$ (... ... ...)

[8]   If $f: \mathrm{R} \to \mathrm{R}^{+}$, $f(x) = \sin(x^2)$, then f is not one to one function.   (.........)

[9]   The function $f(x) = \dfrac{x^2-x-6}{x^2-9}$ has a horizontal asymptote line: $y = 1$ (... ... ...)

[10] The hash function $h(x)$ is one to one because $h(137) = h(258)$ (... ... ...)

Second Question (10- Marks)

Choose the correct answer

[11]   The value of a that makes the function $f(x) = x^2 + ax$ <u>odd</u> is: {0 , 1 , -1}

[12]   If $f(x): \mathcal{R} \to [-1,1]: x \to \sin x$, then f is not……   { one to one; Onto}

[13] $3 \lceil -1.5 \rceil + 2 \lfloor -0.5 \rfloor = \cdots$ {5 , -5 , 0}

[14]   The general term of the infinite series $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \dots, n \geq 1$ is $\{\frac{n}{n+1}, \frac{1}{2^n+1}, \frac{n}{n-1}\}$

[15]   The domain of the function $f(x) = e^x$ is…   { $\mathcal{R}^{-}$; $\mathcal{R}$; $\mathcal{R}^{+}$ }

[16]   If the relation $R \cup R^{-1}$ maks R ……. closure.   {reflexive; transitive, symmetric}

[17]   The range of the function $f(x) = \mathrm{Log}(x)$ is   { $\mathcal{R}$, $\mathcal{R}^{+}$, $\mathcal{R}^{-}$}

[18] $-3 \times h\,(210) + 12\ mod\ 5$ equals   {1 , -1, 0}

[19]   The Fibonacci sequence $f_n = f_{n-1} + f_{n-2}$ is of order …   { 0 ; 1   ; 2 }

[20]   The number of ways in which 2 persons can be selected from a group of 6 persons is: {30, 15,   20}

❶ For the function $f(x) = \frac{x-1}{x+3}$

   ① Find the vertical and horizontal asymptote lines of the given function (if any).

   ② Graph the function
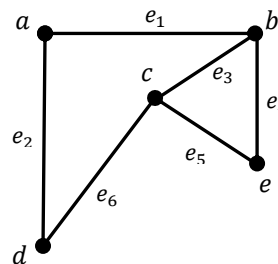
Solution

❷ **Express** the function $f(t)$ by the **unit step function**, where $f(t) = \begin{cases} 3 & 0 < t \le 2 \\ t & 2 < t \le 3 \\ -t & 3 < t \le 5 \end{cases}$

❸ Construct the **tree** for the expression: $(x \div y) \div \big((x \times 3) - (z \div 4)\big)$, and then find the **height** of the tree.

❶ Use **Maclaurin series** to **approximate** the function $f(x) = e^{2x}$ to just four terms and then use this to approximate the value $f(0.1)$.

❷ Change the lower **index** of the summation $\sum_{j=2}^{j=n} a_j$ to start with $k = 7$.

❸ **(a)** From the opposite figure, complete:

   (1) The **adjacency** matrix is $A =$

   (2) The **Laplacian** matrix is $L =$

   (3) The **incident** matrix is $I =$

  (b) Find the **degree** of each vertex.