Suez Canal University
Faculty of Computers & Informatics
First Semester; First Level
Date: 2 -1-2023; Time: 3- Hours

Final Examination تخلفات (لائحة قديمة)
Discrete Mathematics BS - 103

الإمتحان يقع فى ورقة من صفحتين.

First Question (10- Marks)

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

[1] $\lceil x \rceil - \lfloor x \rfloor = \begin{Bmatrix} 0 & \text{if } x \in z \\ 1 & \text{if } x \notin z \end{Bmatrix}$ (… … …)

[2] If n is a positive even integer, then n^n should be positive even integer (… … …)

[3] If $x \bmod y = r$, then y divides $r - x$ (… … …)

[4] $j! = \sum_{k=1}^{j} k, \quad j \in z^+$ (… … …)

[5] The horizontal asymptote line of $f(x) = 5e^{2x}$ is $y = 0$ (… … …)

[6] $\bar{A} = \{x: (x \notin A) \wedge (x \notin S)\}$ where S is the universal set. (… … …)

[7] The general term of the sequence: 7, 0.7, 0.07, … is $\left(\frac{7}{10^n}\right)$ for $n \geq 0$ (… … …)

[8] The function $f(x) = e^{-x}$ has no vertical asymptote line (… … …)

[9] $\overline{\bigcup_{n=1}^{N}} A_n = \{x | \forall n, x \in A_n\}$ (… … …)

[10] Taylor series is a special case of Maclaurin series (… … …)

Second Question (10- Marks)

Choose the correct answer

[11] If n is an positive integer, then $n! = \cdots$ {(a) $\prod_{j=0}^{n} j$; (b) $\prod_{j=1}^{n} j$; (c) $\sum_{j=0}^{n} j$;(d) $\sum_{j=1}^{n} j$}

[12] If $S_n = \{n^2k^2 \mid k = 1,2\}$, then $\cup_{n=2}^{3} S_n = \cdots$ {(a) $\{4,16,9,36\}$; (b) $\{4,16,9,25\}$; (c) $\{16,9,25,36\}$}

[13] If $h: Z \to \{0,1,\dots,10]$, then the hash function $h(x)$ is … {(a) one to one ; (b) onto ; (c) bijective }

[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 $f(x) = \text{Log}(x)$ 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}

Third Question (30- Marks).

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

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

❸ Construct the tree of the following expressions: $(x + y) \div \big((2 \times x) + (y \div 2)\big)$, and then find the height of the tree.

Fourth Question (30- Marks).

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

❷ Change the lower index of the summation $\sum_{j=1}^{j=n} a_{j+1}$ to start with $k = 0$.

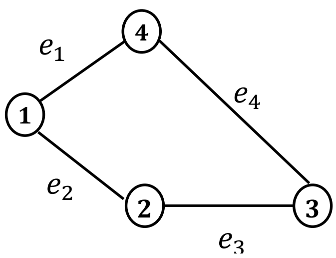
❸ (a) From the opposite figure, complete:

(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.



------------- (إنتهت الأسئلة) -------------

أطيب ألامنيات بالنجاح والتوفيق أ.د.م/ ياسر عبد الستار