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| animatedLOGO | **Assignment No. 02 Spring 2024 CS502- Fundamentals of Algorithms** | | **Total Marks: 20**  **Due Date: 24-06-2024** |
| Instructions  Please read the following instructions carefully before solving & submitting assignment:  It should be clear that your assignment will not get any credit (zero marks) if:  The assignment is submitted after due date.  The submitted assignment is other than MS Word file.  The submitted assignment does NOT open or file is corrupted.  The assignment is copied (from other student or ditto copy from handouts or internet).  **Uploading instructions**  For clarity and simplicity, you are required to upload/submit only one **.doc/docx** file.  **Lectures:**  Lectures 20 to 25 are covered in this assignment.  **Objectives**  The objectives of this assignment are;  To be able to understand the concept of Greedy Algorithms.  To be able to understand the concept of Huffman Encoding.  For any query about the assignment, contact at [CS502@vu.edu.pk](mailto:CS502@vu.edu.pk)  Good Luck!  **Question No. 1 Marks: 20**  Suppose you are working on a project that involves compressing a large amount of text data. You have decided to use Huffman encoding to achieve this compression.  Given the string:  **HuffmanEncodingTree**  **Part 1:** Calculate the total required number of bits for the ASCII code representation of the above given string without compression of text? **(2.5 marks)**  **Answer:**  **Each character in the ASCII representation requries 8 bits and length of string is 19 character**  **therefore:**  **Total required bits: 19 characters x 8 bits/character = 152 bits**  **Part 2:** Calculate the frequencies of each character of the given string in a tabular form. **(5 marks)**  **Answer:**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Character** | H | u | f | m | a | n | E | c | o | d | i | g | T | r | e | | **Frequency** | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |   **Part 3:** Calculate the total required number of bits for the variable-length code representation of the above given string from the frequency table? **(2.5 marks)**  **Answer:**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Character** | H | u | f | m | a | n | E | c | o | d | i | g | T | r | e | | **Frequency** | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | Huffman Coding variable length code | oo1oo | 00101 | 0101 | 01000 | 01001 | 000 | 01100 | 01101 | 01110 | 01111 | 11100 | 11101 | 11110 | 11111 | 0011 | | Total required bits | 5 | 5 | 8 | 5 | 5 | 9 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 8 |   **Total required bits = 85**  **Part 4:** Construct a Huffman encoding tree based on the character frequencies. **(10 marks)** | | | |
|  | | **Total Marks: 20** | |