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Batch: M13

Roll no: 35141

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%=====
% Experiment No. 10: To Implementation of Huffman codes by using suitable software.
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% --- Initial Setup and Input Data ---
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```
clc;
```

```
clear all;
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```
close all;
```

```
symbols = {1, 2, 3, 4, 5, 6};
```

```
probabilities = [0.3, 0.25, 0.2, 0.12, 0.08, 0.05];
```

```
entropy = -sum(probabilities .* log2(probabilities));
```

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%=====
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```
% Huffman Coding Implementation
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%=====
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numeric_symbols = 1:length(symbols);
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```
huffman_dict = huffmandict(numeric_symbols, probabilities);
```

```
huffman_codes = huffman_dict;
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```
huff_lengths = cellfun(@length, huffman_codes);
```

```
huff_avg_length = sum(probabilities .* huff_lengths);
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```
huff_efficiency = entropy / huff_avg_length;
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```
huff_redundancy = 1 - huff_efficiency;
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%=====
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% --- Display Final Results ---
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%=====
fprintf('=====\\n');
fprintf('      Huffman Code Results\\n');
fprintf('=====\\n');
disp('Generated Codes:');
for i = 1:length(symbols)
    code_as_string = strrep(num2str(huffman_codes{i}), ' ', '');
    fprintf(' Symbol x%d (p=%.2f): %s\\n', symbols{i}, probabilities(i), code_as_string);
end
disp('-----');
fprintf('1. Source Entropy (H)      : %.4f bits/symbol\\n', entropy);
fprintf('2. Average Code Length (L) : %.4f bits/symbol\\n', huff_avg_length);
fprintf('3. Code Efficiency (eta)   : %.4f or %.2f%%\\n', huff_efficiency, huff_efficiency *
100);
fprintf('4. Redundancy (gamma)      : %.4f or %.2f%%\\n', huff_redundancy, huff_redundancy
* 100);
fprintf('=====\\n');

```

OUTPUT:

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=====
                        Huffman Code Results
=====
Generated Codes:
  Symbol x1 (p=0.30): 00
  Symbol x2 (p=0.25): 01
  Symbol x3 (p=0.20): 11
  Symbol x4 (p=0.12): 101
  Symbol x5 (p=0.08): 1000
  Symbol x6 (p=0.05): 1001
-----
1. Source Entropy (H)      : 2.3601 bits/symbol
2. Average Code Length (L) : 2.3800 bits/symbol
3. Code Efficiency (eta)   : 0.9917 or 99.17%
4. Redundancy (gamma)      : 0.0083 or 0.83%
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>>

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