**(a) One method of reducing bandwidth use is to compress the data being transmitted. Let A = {a/20, b/15, c/5, d/15, e/45} be the alphabet and its frequency distribution. Compute the optimal coding for each character. What is the average number of bits/symbol of the codes?**

**(b) Briefly explain how delta compression works and give an application as example where delta compression is used.**

Delta compression is a lossless external compression algorithm. It doesn’t remove any data, and operates by considering what was sent in previous packets.

The Sender transmits complete state snapshots, like current position or ammo total. Messages sent only contain changes made since the snapshot sent.

An example of delta compression in use is MPEG 4.

MPEG 4 uses I Frames and P Frames for data transmission I Frame contains complete frame information. P Frame contains changes since last transmitted I Frame.

Delta compression is good for variables that don’t change too often, such as equipped items or health.

**(c) One method of reducing bandwidth use is to compress the data being transmitted. Use the LZW algorithm to compress the string: BABAABAAA. Note that Uppercase A has ASCII value 65 in decimal. Draw diagrams to aid your explanation if appropriate.**

Normal ASCII table goes to a max value of 127, so we will assume new entries to our dictionary come after 127.

|  |  |  |  |
| --- | --- | --- | --- |
| Current | Next | Output | Dictionary |
| B (66) | A (65) | B (66) | BA (128) |
| A (65) | B (66) | A (65) | AB (129) |
| B (66) | A (65) | BA In Dictionary |  |
| BA (128) | A (65) | BA (128) | BAA (129) |
| B | A | BA In Dictionary |  |
| BA (128) | A (65) | BAA In Dictionary |  |
| BAA (129) | A (65) | BAA (129) | BAAA (130) |
|  |  |  |  |
|  |  |  |  |

**Output is now 66 65 128 129**