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COMS W1004

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Problem set 3

Chapter 4: 15, 25, 26

a)

No of samples: 3\*60\*40,000 = 7,200,000

No. of bits per sample: 16 bits

Amount of storage for song: 7,200,000\*16 = **115,200,000 bits**

Compressed data: 115,200,000 \* 1/5 = **23,040,000 bits**

b)

No. of pixels: 1,200\*800 = 960,000 pixels

Amount of storage per pixel: 24 bits

Total amount of storage: 960,000 \* 24 = **23,040,000 bits**

2.4M bits = 2400000 bits

Compression ratio: 23,040,000/2400000 = **48:5**

Q25 Solution:

Diagram

Description automatically generated

Question 26 Solution:

Diagram

Description automatically generated

Chapter 5: 19, 21, 22

Question 19 Solution:

1. 2^6 = **64** **distinct operation** **codes**
2. Maximum memory size: 2^18 = **262144 bits**
3. No. of bits required = 6+18+18 = 42 bits = 5.25 = **6 bytes**

Question 21 Solution:

|  |  |  |
| --- | --- | --- |
| Address | Contents | Commentary |
| 50 | SUBTRACT 202, 203, 200 | v = x-y |
| 51 | ADD 204, 200 | v = v+z |
| 52 | HALT | End |

|  |  |  |
| --- | --- | --- |
| Address | Contents | Commentary |
| 50 | ADD 201, 202, 200 | v = w+x |
| 51 | ADD 203, 204 | z = y+z |
| 52 | SUBTRACT 200, 204, 200 | v = v-z |
| 53 | HALT | End |

|  |  |  |
| --- | --- | --- |
| Address | Contents | Commentary |
| 50 | COMPARE 200, 201 | Check v and w |
| 51 | JUMPGE 54 | If v>=w. Go to 55 |
| 52 | MOVE 204, 202 | x=z |
| 53 | HALT | End |
| 54 | MOVE 203, 202 | x=y |
| 55 | HALT | End |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Address | Contents | Commentary |
| 50 | COMPARE 203, 204 | Check y and z |
| 51 | JUMPLT 53 | If y<z |
| 52 | HALT | End |
| 53 | ADD 201, 203 | y=y+w |
| 54 | ADD 204, 203 | y=z+y |
| 55 | ADD 200, 204 | z=z+v |
| 56 | JUMP 50 | Go to 50 |
|  |  |  |
|  |  |  |

Question 22 Solution:



|  |  |  |
| --- | --- | --- |
| Address | Contents | Commentary |
| 50 | ADD 301, 300 | a=a+b |
| 51 | ADD 401, 300 | a=a-1 |
| 52 | HALT | End |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Address | Contents | Commentary |
| 50 | COMPARE 300, 402 | Check a and 0 |
| 51 | JUMGT 53 | If a>0 |
| 52 | HALT | End |
| 53 | MOVE 400, 301 | b=+1 |
| 54 | HALT | End |
|  |  |  |