Q1: What are the coding requirements?

1. storage requirements
2. bandwidth requirements
3. Pressure required!!!!!!!

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Q2: What are the storage requirements?

1. Uncompressed audio.
2. CD sound quality.
3. PAL video format

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Q3: What is uncompressed audio?

- ✓ 8 kHz, 8 quantum bits means 64 kilobits of storage per second

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Q4: What is the CD sound quality?

- ✓ 44.1 kHz, 16-bit quantization means 705.6 Kbit/s stored

……

Q5: What is the PAL video format:

1. 640X480 pixels, 24-bit, 25 frames per second, means 184,320,000 bits/sec stored = 23,040,000 bytes/sec
2. Frames per second (frames per second), used to measure the frame rate in a motion picture

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Q6: What are the bandwidth requirements?

1. Uncompressed audio: 64 kbps
2. CD audio quality: 705.6 kbps
3. PAL video format: 184,320,000 bits/sec

……

Q7: Coding Format Examples?

1. JPEG for still images
2. H.261/H.263 for video conferencing, music and speech (dialog mode applications)
3. MPEG-1, MPEG-2, MPEG-4 for audio/video playback, VOD (retrieval mode applications)
4. DVI for still and continuous video applications (two modes of compression)
5. Presentation Level Video (PLV) - high quality compression, but very slow. Suitable for applications distributed on CD-ROMs
6. Real-time Video (RTV) - lower quality compression, but fast. Used in video conferencing applications.

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Q8: how to Dialog mode applications?

1. End-to-end Delay (EED) should not exceed 150-200 ms
2. Face-to-face application needs an EED of 50ms (including compression and decompression).

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Q9: how to Retrieval mode applications?

1. Fast-forward and rewind data retrieval with simultaneous display (e.g. fast search for information in a multimedia database).
2. Random access to single images and audio frames, access time should be less than 0.5sec
3. Decompression of images, video, and audio

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Q10: what are Requirements for both dialog and retrieval mode applications?

1. Support for scalable video in different systems.
2. Support for various audio and video rates.
3. Synchronization of audio-video streams (lip synchronization)
4. Economy of solutions
5. Compatibility

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Q11: what does implies Compression in software ?

- ✓ implies a cheaper, slower, and low-quality solution.

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Q12: what does implies Compression in hardware?

- ✓ implies an expensive, faster, and high-quality solution.

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Q13: what is Classification of Compression Techniques?

1. Entropy Coding
2. Source Coding
3. Hybrid Coding (used by most multimedia systems)

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Q14: what is Entropy Coding?

1. lossless encoding
2. used regardless of the media's specific characteristics
3. data were taken as a simple digital sequence
4. decompression process regenerates data completely
5. e.g. run-length coding, Huffman coding, Arithmetic coding

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Q15: what is Source Coding?

1. lossy encoding
2. the semantics of the data is considered
3. degree of compression depends on data content.
4. E.g. content prediction technique - DPCM, delta modulation

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Q16: what is Hybrid Coding (used by most multimedia systems)?

1. combine entropy with source encoding
2. E.g. JPEG, H.263, DVI (RTV & PLV), MPEG-1, MPEG-2, MPEG-4

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Q17: what is Steps in Compression?

1. Picture preparation
2. Picture processing (compression algorithm)
3. Quantization
4. Entropy coding

……

Q18: what is Steps in Picture preparation?

1. analog-to-digital conversion
2. generation of appropriate digital representation
3. image division into 8×8 blocks
4. fix the number of bits per pixel

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Q19: what is Steps in Picture processing (compression algorithm)?

1. transformation from time to frequency domain, e.g. DCT
2. motion vector computation for digital video.

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Q20: what is Steps in Quantization?

1. Mapping real numbers to integers (reduction in precision).
2. E.g. U-law encoding - 12bits for real values, 8 bits for integer values

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Q21: what is Steps in Entropy coding?

- ✓ compress a sequential digital stream without loss.

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Q22: what is Symmetric Compression?

1. Same time needed for decoding and encoding of data
2. Used for dialog mode applications

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Q23: what is Asymmetric Compression?

1. Compression process is performed once and enough time is available, hence compression can take longer.
2. Decompression is performed frequently and must be done fast.
3. Used for retrieval mode applications

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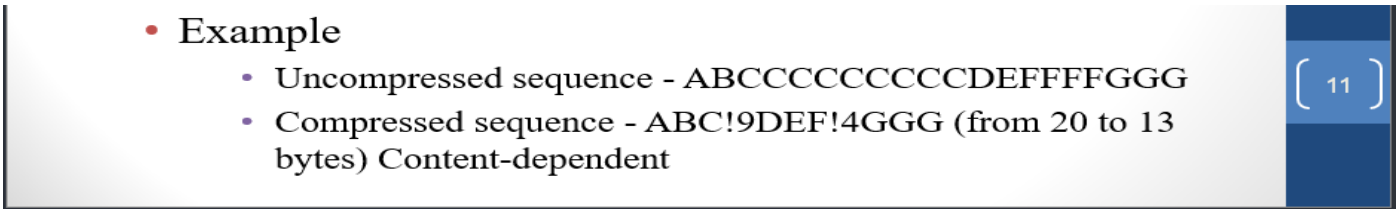

Differential Encoding example

0	0	0	0	0
0	255	250	253	251
0	255	251	254	255
0	0	0	0	0

Compressed sequence: M5, 0, 255, -5, 3, -2, 0, 255, -4, 3, 1

Example of Huffman Encoding