Question Paper

Exam Date & Time: 23-Apr-2024 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal Second Semester Master of Engineering - ME (Big Data Analytics) Degree Examination - April / May 2024

Multimedia Analytics [BDA 5203]

Marks: 100

4)

Duration: 180 mins.

Tuesday, April 23, 2024

Answer all the questions.

- ¹⁾ With a neat anatomical diagram illustrate the human ⁽¹⁰⁾ auditory peripheral system and how they are used to model speech processing algorithms. (L3, CO 1, PO 3)
- ²⁾ With the help of a block diagram, identify the five main ⁽¹⁰⁾ stages associated with the baseline mode of operation of JPEG encoder and give a brief description of the role of image/block preparation and forward DCT. (L2, CO2, PO 3)
- ³⁾ A series of messages is to be transferred between two ⁽¹⁰⁾ computers over a PSTN. The messages comprise just the characters A through H. Analysis has shown that the probability (relative frequency of occurrence) of each character is as follows: A and B=0.25, C and D=0.14, E,F,G and H=0.055

(a) Use Shannon's formula to solve for the minimum average number of bits per character.

(b) Use Huffman coding to solve for a codeword set and prove this is the minimum set by constructing the corresponding Huffman code tree.

(c) Solve for the average number of bits per character for your codeword set and compare this with:

(i) The entropy of the messages(Shannon's value),

(ii) Fixed-length binary codewords,

(iii) 7-bit ASCII codewords. (L3, CO 2, PO 3)

Discuss the following image properties:

i. Additive Colour Mixing

(10)

ii. Subtractive Colour Mixingiii. Pixel Depthiv. Aspect Ratio. (L2, CO 2, PO 3)

- ⁵⁾ Derive the bit rate and the memory requirements to store ⁽¹⁰⁾ each frame that result from the digitization of both a 525 and 625 -line system assuring a 4:2:2 format. Also find the total memory required to store a 1.5 hour movie/video. (L4, CO 3, PO 3)
- ⁶⁾ Given the following string as input "ABABBABCABABBA" ⁽¹⁰⁾ with assuming the initial dictionary, encode the sequence with LZW algorithm, showing the intermediate steps. (L2, CO 2, PO 3)
- ⁷⁾ Define image Segmentation, identify the need for it in ⁽¹⁰⁾ different application domain and describe the steps employed Haar feature-based cascade classifiers. (L2, CO 2, PO 3)
- ⁸⁾ Assuming the B/W of a signal is from 50 Hz through to ⁽¹⁰⁾ 10kHz and that of a music signal is from 15Hz through to 20kHz, derive the bit rate that is generated by the digitization procedure in each case assuming that Nyquist sampling rate is used with 12 bits/sample for the speech signal and 16 bits/sample for the music signal. Derive the memory required to store a 10 minute passage of stereophonic music. (L3, CO 1, PO 3)
- ⁹⁾ Describe steps involved in face recognition system. (L2, ⁽¹⁰⁾ CO 2, PO 3)
- ¹⁰⁾ Illustrate with a diagram how I, P and B frames are ⁽¹⁰⁾ encoded in Videos. (L2, CO 3, PO 2)

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