Question Paper

Exam Date & Time: 24-May-2023 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal
Second Semester Master of Engineering - ME (Big Data Analytics) Degree Examination - May 2023

Multimedia Analytics [BDA 5203]

Marks: 100 **Duration: 180 mins.**

Wednesday, May 24, 2023

Answer all the questions.

1)	**With a neat anatomical diagram demonstrate the human speech production system. (L3, CO 1, PO 1)**	(10)
2)	**Demonstrate the extraction pipeline for the frequency-domain audio feature. (L3, CO 1, PO 2)**	(10)
3)	**Demonstrate how a colour image is captured within a digital camera using each of the following methods: i. Single image Sensor. ii. A single image sensor with filters iii. Three separate image sensors (L3, CO2, PO2, PO3)**	(10)
4)	**Explain RGB and HSV colour model. (L2, CO2, PO1, PO2)**	(10)
5)	**Discuss the following video encoding standards: i. MPEG2 ii. MPEG4 iii. MPEG7 and MPEG21. Highlight the advances made in each standard. (L2, CO3, PO1)**	(10)
6)	**A series of messages is to be transferred between two 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 characters. (b) Use Huffman coding to solve for a codeword set and prove this is the minimum set by constructing the corresponding Huffman code tree.**	(10)

(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, CO2, PO3)

7) **Assuming the B/W of a signal is from 50 Hz through to 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, CO1, PO3)** (10)

8) **Examine the bit rate and the memory requirements to store each frame that result from the digitization of both a 525 and 625 -line system assuring a 4:2:0 format. Also find the total memory required to store a 1.5 hour movie/video. (L4, CO3, PO3)** (10)

9) **Describe steps involved in face recognition system. (L2, CO3, PO2)** (10)

10) **Explain four types of shot boundary detection techniques in video segmentation process. Specify the performance parameter used to measure the accuracy of the techniques. (L2, CO3, PO 1, 2)** (10)

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