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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

Branch: Electronics and Telecommunication Engineering **Duration: 3 hrs.**

Course Code: 22ET5PCSPM **Max Marks: 100**

Course: Signal Processing for Multimedia

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Describe the speech and video interpersonal communication in multimedia application	*CO2*	*PO1*	**08**
	b)	Describe about the Integrated Services Digital networks.	*CO2*	*PO1*	**07**
	c)	Briefly describe about Computer Supported Cooperative working	*CO2*	*PO1*	**05**
		OR			
2	a)	In relation to speech-only interpersonal communications involving both public and private networks, explain how voice – mail and teleconferencing are supported with neat diagram.	*CO2*	*PO1*	**08**
	b)	With neat diagram, explain the function of the telephony gateway in relation to internet telephony.	*CO2*	*PO1*	**07**
	c)	Explain the need for modems over a PSTN. With the help of the diagram, show the location of the two modems when two digital devices communicate over a PSTN. Show the type of signal used over each part of the circuit.	*CO2*	*PO1*	**05**
		UNIT - II			
3	a)	Describe the three types used for representing the Text in multimedia communication. Explain the formatted text with an example.	*CO2*	*PO1*	**10**
	b)	A series of messages is to be transferred between the two computers over a PSTN. The messages comprise the characters A through H. The 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; (i) Use shannon's formula to derive the minimum average number of bits per character.	*CO3*	*PO2*	**10**

			(ii) Use Huffman coding to derive a codeword set and prove this is the minimum set by constructing the corresponding Huffman code tree.			
			OR			
	4	a)	Derive the transmitted bit pattern corresponding to the character string "AAABCB" using adaptive Huffman coding. Consider the initial code given by A: 00001, B: 00010, C: 00011.	*CO3*	*PO2*	**10**
		b)	A message comprising a string of characters is transmitted with the probabilities of e= 0.3, n=0.3, t=0.2, w=0.1 and .=0.1. Encode the string went. using arithmetic coding and obtain the range of string.	*CO3*	*PO2*	**10**
			UNIT - III			
	5	a)	Derive the time to transmit the following digitized images at both 64Kbps and 1.5Mbps • A 640 x 480 x 8 VGA compatible image • A 1024 x 768 x 24 SVGA compatible image	*CO3*	*PO2*	**05**
		b)	Briefly describe the schematic of JPEG decoder with a block diagram	*CO2*	*PO1*	**10**
		c)	Explain how LZW coding algorithm is applied to the image data in relation to GIF.	*CO2*	*PO1*	**05**
			OR			
	6	a)	Derive the number of pixels per scan line that are used to obtain square pixels assuming a 4/3 aspect ratio. Identify the number of scan lines per frame associated with PAL system and the number of visible lines per frame.	*CO3*	*PO2*	**05**
		b)	Describe the Modified-modified READ coding procedure with a flow diagram	*CO2*	*PO1*	**10**
		c)	With the neat diagram, explain how a digital image produced by a digital camera is captured and stored within the memory of the computer.	*CO2*	*PO1*	**05**
			UNIT - IV			
	7	a)	Assuming the bandwidth of a speech signal is from 50 Hz to 10KHz and that of a music signal is from 15 Hz to 20 KHz, derive the bit rate that is generated by the digitization procedure in each case assuming the nyquist sampling rate is used with 12 bits per sample for the speech signal and 16 bits per sample for the music signal. Derive the memory required to store a 10 minute passage of stereophonic music.	*CO3*	*PO2*	**05**
		b)	Briefly describe the CD-quality audio	*CO2*	*PO1*	**05**

		c)	Describe the encoding and decoding schematic of the Linear predictive coding	*CO2*	*PO1*	**10**
			OR			
	8	a)	Assuming the CD-DA standard is being used, derive: (i) the storage capacity of a CD-ROM to store a 60 minute multimedia title. (ii) the time to transmit a 30 second portion of the title using a transmission channel of bit rate: • 64 Kbps • 1.5 Mbps	*CO3*	*PO2*	**05**
		b)	Briefly describe about adaptive predictive coding	*CO2*	*PO1*	**05**
		b)	Describe the backward adaptive bit allocation and hybrid backward / forward adaptive bit allocation in Dolby audio coders	*CO2*	*PO1*	**10**
			UNIT - V			
	9	a)	Derive the bit rate and the memory requirements to store each frame that result from the digitization of both a 525- line and a 625-line system assuming a 4:2:2 format. Also find the total memory required to store a 1.5 hour movie/video.	*CO3*	*PO2*	**10**
		b)	Obtain the scaling factors used for both the U and V and I and Q color difference signals in terms of the three R,G,B color signals. Explain how two colour difference signals are transmitted within the same frequency band as that used for the luminance signal.	*CO2*	*PO1*	**10**
			OR			
	10	a)	Derive the bit rate and the memory requirements to store each frame that result from the digitization of both a 525- line and a 625-line system assuming a 4:2:0 format. Also find the total memory required to store a 2 hour movie/video.	*CO3*	*PO2*	**10**
		b)	With neat diagram explain the encoding and decoding procedure of I- , P- and B-frames.	*CO2*	*PO1*	**10**

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