U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 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.

			UNIT - I	***CO***	***PO***	**Marks**
	1	a)	Describe the packet mode network with respect to (i) Connection oriented network (ii) Connectionless network	*CO1*	-	**10**
		b)	Draw and explain the architecture of ISDN. Explain their role in Multimedia.	*CO1*	-	**10**
			OR			
	2	a)	With the neat diagram, explain the basic principles behind computer-supported cooperative working (CSCW).	*CO1*	-	**10**
		b	With neat diagram, illustrate the following i) Two party video phone call ii) Video conferencing call using MCU iii) Video conferencing call using broadcast	*CO1*	-	**10**
			UNIT - II			
	3	a)	Explain the principle of operation of the LZW compression algorithm and how is it different from the LZ algorithm.	*CO2*	*PO1*	**05**
		b)	Encode the character string ***ababbabcababba*** using Lempel-Ziv-Welch coding	*CO2*	*PO1*	**05**
		c)	A series of messages is to be transferred between two computers over PSTN. The messages comprise just the characters A through H. Probability 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 (ii) Use Huffman coding to derive a code word set and prove this is the minimum set by constructing the corresponding Huffman code tree (iii) Derive the average number of bits per character for your	*CO2*	*PO1*	**10**

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.

<table>
<tr><td></td><td></td><td></td><td>code word set and compare this with fixed length binary code words.</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>a)</td><td></td><td>With a flowchart describe the Huffman decoding Algorithm.</td><td>CO2</td><td>PO1</td><td>05</td></tr>
<tr><td></td><td>b)</td><td></td><td>The LZ algorithm is to be used to compress a text file prior to its transmission. If the average number of characters per word is 6, and the dictionary used contains 4096 words, derive the average compression ratio that is achieved relative to using 7 bit ASCII code words.</td><td>CO2</td><td>PO1</td><td>05</td></tr>
<tr><td></td><td>b)</td><td></td><td>Consider the transmission of message comprising a string of characters:

e = 0.3, n = 0.3, t = 0.2, w = 0.1, . = 0.1. The character ‘.’ is sent to indicate the end of each character string. Apply Arithmetic coding to derive a single code word for each encoded string of characters.</td><td>CO2</td><td>PO1</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - III</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>a)</td><td></td><td>Describe color image capturing methods using block diagram</td><td>CO1</td><td>-</td><td>06</td></tr>
<tr><td></td><td>b)</td><td></td><td>Consider JPEG compression applied on a image block of 8*8. The DC coefficient is 12 and run length encoded AC coefficients are (0,6),(0,7),(3,3),(0,-1) and (0,0). The Huffman table is given below.

<table>
<tr><td colspan="2">Huffman code for DC Coefficients</td><td colspan="2">Huffman code for AC Coefficients</td></tr>
<tr><td>SSS</td><td>Code word</td><td>SSS</td><td>Code word</td></tr>
<tr><td>1</td><td>011</td><td>0</td><td>1010</td></tr>
<tr><td>2</td><td>100</td><td>1</td><td>00</td></tr>
<tr><td>3</td><td>00</td><td>2</td><td>111110111</td></tr>
<tr><td>4</td><td>101</td><td>3</td><td>100</td></tr>
</table>

(i) Determine the encoded bit stream for DC coefficient
(Give the necessary encoding table)
(ii) Determine the encoded bit stream for AC coefficients
(Give the necessary encoding table)
(iii) Determine the compression ratio achieved with JPEG and without JPEG (considering 8 bits per pixel)</td><td>CO3</td><td>PO2</td><td>08</td></tr>
<tr><td></td><td>c)</td><td></td><td>Describe JPEG Decoder using block diagram</td><td>CO1</td><td>-</td><td>06</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td>a</td><td></td><td>With the neat diagram, explain the three methods of how a colour image is captured within a camera or scanner.</td><td>CO1</td><td>-</td><td>06</td></tr>
<tr><td></td><td>b</td><td></td><td>Identify the importance of the given expression in the JPEG compression standard. Also identify the five main stages associated with the baseline mode of operation of JPEG in achieving the desired compression ratio.

$F[i,j] = \frac{1}{4}C(i)C(j)\sum_{x=0}^{7}\sum_{y=0}^{7}P[x,y]$
Where C(i) and C(j) = $1/\sqrt{2}$ for i=j=0
= 1 for other values of i and j
P[x,y] – input matrix and Fi,j] – transformed matrix.</td><td>CO3</td><td>PO2</td><td>08</td></tr>
</table>

		c	Explain the basic mode of operation of GIF including the colour table used.	*CO1*	-	**06**
			UNIT - IV			
	7	a)	Draw the schematic of LPC Encoder. Also explain in brief	*CO1*	-	**08**
		b)	Assuming the CD-DA standard is being used derive the storage capacity of a CD ROM to store a 60 minute multimedia title.	*CO2*	*PO1*	**06**
		c)	Draw and explain the characteristics of sensitivity of human ear as a function of frequency.	*CO1*	-	**06**
			OR			
	8	a)	Draw the schematic of LPC Decoder. Also explain in brief	*CO1*	-	**08**
		b)	Assuming the CD-DA standard is being used, derive The time to transmit a 30 second portion of the title using a transmission channel of bit rate 64 Kbps and 1.5 Mbps	*CO2*	*PO1*	**06**
		c)	With the help of block diagram describe dolby AC-1	*CO1*	-	**06**
			UNIT - V			
	9	a	Derive the bit rate and the memory requirement to store each frame that result from the digitization of both a 525 line and a 625 line system assuming 4:2:0 format. Also find the total memory required to store a 1.5 hour movie/video	*CO2*	*PO1*	**08**
		b	With neat diagram, explain how the motion vector and prediction error are computed for a P-frame.	*CO1*	-	**08**
		c	Explain the following terms with respect to animation: grey scale colour, RGB colour and colour transparency, sketch, sketch book.	*CO1*	-	**04**
			OR			
	10	a)	Derive the bit rate and the memory requirement to store each frame that result from the digitization of both a 525 line and a 625-line system assuming 4:2:2 format. Also find the total memory required to store a 1.5-hour movie/video	*CO2*	*PO1*	**08**
		b)	Draw and explain the bandwidth requirement of brightness and color components of following video standards (i) NTSC (ii) PAL	*CO1*	-	**08**
		c)	What are the different file types used in animation techniques? Discuss in brief.	*CO1*	-	**04**

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