Model Question Paper
Second Semester M. Tech Degree Examination in
Electronics and Communication Engineering
Stream: Telecommunication Engineering (2013 Scheme)
TTE-2006: IMAGE AND VIDEO PROCESSING

Time : 3 hours Max. Marks : 60

Instructions: *Answer any 2 questions from each module (Each Carries 10 Marks)*

Module I

1. a) Derive the CMY transformation to generate the compliments of a color image? (5 marks)

   b) Derive the CMY intensity mapping function of equation $S_i=kr_i+(1-k)$ where i=1, 2, 3…. from its RGB counterpart in equation $S_i=kr_i$. (5 marks)
2. Derive a Wiener filter for image restoration using Minimum mean square Approach. Also mention the situation in which the behavior of Weiner filter resembles the behavior of Inverse filter? (10 marks)
3. a) Obtain the Haar transformation matrix for N=2 and also explain the algorithm to generate Haar basis? (5 marks)

   b) Perform KL transform for the following matrix

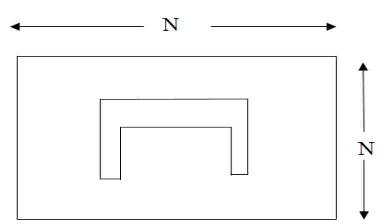
$$\begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$$

(5 marks)

Module II

4. a) The compass gradient operators of size 3x3 are designed to measure gradients of edges oriented in eight directions: E, NE, N, NW, W, SW, S and SE.Give the form of these eight operators using coeffients valued 0,1 or -1.Specify the gradient direction of each mask keeping in mind that the gradient direction is orthogonal to the edge direction. (5 marks)

   b) Segment the image shown by using split and merge procedure; shown in the figure. Show the quad tree corresponding to the segmentation.



(5 marks)

5. Explain about Watershed transformation algorithm and also specify its drawback? (10 marks)

6. Show how $\sigma^2_B = P_1 P_2 (m_1 - m_2)^2$ follows from the equation $\sigma^2_B = P_1 (m_1 - m_G)^2 + P_2 (m_2 - m_G)^2$ using the conditions $P_1 m_1 + P_2 m_2 = m_G$ and $P_1 + P_2 = 1$ and also show that

$$m_2(k) = \frac{m_G - m(k)}{1 - P_1(k)}$$

(10 marks)

Module III

7. Consider the sample 4x8, 8 bit image

21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243

Compress the image using Huffman code.

a) Calculate the entropy of the image?

b) Calculate the average length, efficiency and redundancy?

c) Compute the compression achieved and the effectiveness of the Huffman coding? (10marks)

8. Explain JPEQ modes and MPEQ H.264 (10marks)

9. a) The arithmetic decoding process is the reverse of the encoding procedure. Decode the message 0.23355 given the coding model as,

SYMBOL	A	E	I	O	U	!
PROBABILITY	0.2	0.3	0.1	0.2	0.1	0.1

(5 marks)

b) Draw the block diagram of lossless predictive coding model and also explain it? (5 marks)