

# B.E. Part III (ETC), 6<sup>th</sup> Semester Final Examination, 2012

## Audio & Video Engineering (ET 604)

Full Marks: 70

Time: 3 hours

*Attempt any five questions from the following*

*Answer should be brief and to the point*

*Unnecessary lengthy answers may result in loss of marks*

1. The relevant data for a closed circuit TV system is given below. Calculate the highest modulating frequency that will be generated while scanning the most stringent case of alternate black and white dots for equal vertical and horizontal resolution.

No. of lines = 250

No. of fields per picture = 1:1

Picture repetition rate = 50/sec

Aspect ratio = 4/3

Vertical retrace time = 10% of the picture frame time

Horizontal retrace time = 20% of the total line time

Resolution factor = 0.8

Why is the vertical deflection very slow as compared to the horizontal deflection?

What would happen if the conventional TV transmission using 625 lines per frame is viewed on a 1-metre wide screen? Why is AMVSB preferred to FM for transmission of video signals? Mention the duration of the V-blanking and V-sync pulses in India.

5+2+2+3+2

2. Sketch the composite video waveforms of TV signal indicating horizontal and vertical sync pulses at the end of an even field. Why it is necessary to keep the duration of the equalizing pulses equal to half-line period? Explain how the horizontal and vertical sync pulses are separated and shaped at the receiver. Why is TV transmission carried out in the VHF and UHF bands?

6+2+4+2

3. Calculate the required amount of memory space to store one 8-bit 512 x 512 color image. Why is tapered or non-uniform quantization very useful in image processing? Name a few image compression techniques. What do you mean by multi-modal histogram? Mention its significance in image segmentation. What is the importance of contrast enhancement in image processing? Design a 3 x 3 mask for an identity filter which causes no change in the image.

3+2+1+4+2+2

4. Consider the 6 x 6 noise-corrupted digital image in Fig. 1. Extract the inner 4 x 4 image matrix from it using the outlier method by choosing a suitable threshold value.

1	1	2	5	3	1
3	20	5	6	4	6
4	6	4	20	2	2
4	3	3	5	1	5
6	5	20	2	20	2
6	3	1	4	1	2

Fig. 1

Explain in brief how can Gaussian noise be removed using image averaging.

10+4

5. How can the edges be detected in an image? Name a few morphological operations. Write down their areas of application. For an image A (Fig. 2) and a kernel B (Fig. 3), calculate the erosion  $A \ominus B$ .

0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	0
0	0	0	1	1	1	1	0
0	1	1	1	1	1	1	0
0	1	1	1	1	1	1	0
0	1	1	1	1	0	0	0
0	1	1	1	1	0	0	0
0	0	0	0	0	0	0	0

Fig. 2

0	1	0
1	1	1
0	1	0

Fig. 3

3+2+2+7

6. 3 ammeters and 2 voltmeters have been used in obtaining 6 different readings to measure one resistance. The experimental outcomes have been listed in Table 1.

Table 1

Variable	1	2	3	4	5	6
Voltage (V)	10	10.1	9.1	9.52	11.6	11.2
Current (mA)	1	1.1	0.9	0.95	1.15	1.2

The absolute value of the resistance identified from its color code is 10KΩ. Design a fuzzy set that describes GOOD-MEASUREMENT. How have the propositional inference rules like 'Modus Ponens' and 'Modus Tollens' been modified through the incorporation of Fuzzy logic? What is the difference between local and non-local fuzzy implication relation? Illustrate with proper examples.

4+5+5

7. What do you mean by 'pattern'? Why is feature extraction considered to be the most important operation in pattern recognition? What do you understand by

unsupervised learning? Show that for recognition of N number of objects with overlapping features into C number of clusters, the membership distribution function of  $k^{th}$  member  $X_k$  in  $i^{th}$  cluster  $A_i$  can be represented by:

$$\mu_{A_i}(X_k) = \frac{1}{\sum_{j=1}^C \left( \frac{\|X_k - V_i\|^2}{\|X_k - V_j\|^2} \right)^{1/m-1}} \quad \text{for } 1 \leq i \leq C \quad \text{and} \quad 1 \leq k \leq N \quad \text{where } V_i$$

corresponds to the cluster center of  $A_i$ .

2+2+2+8

8. Write short notes:

- (a) PAL encoder
- (b) Color models

7+7

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