

2009 MEC603 ADVANCED METROLOGY AND COMPUTER AIDED INSPECTION TEST II

Max. Marks: 20

Time: 60 minutes

1. The power consumption of an electric iron is calculated from measurements of voltage (5 readings) and current (9 readings). The uncertainty budget (incomplete) is given below. Determine the expanded uncertainty interval for Power (95%).

Quantity	Average Value	Std Unc	dof	Sensitivity	Contribution
Voltage	230 V	3.2	?	1.2	3.84
Current	1.2 A	0.02	?	230	4.6
Power	276 W	5.992128	?		

(4 marks)

2. Cheap plastic belts are manufactured by a company for the local market. The centre distance between two holes on the belt is specified as 60+/-0.5 mm. The measured value for this parameter for one belt was 60.58 mm with expanded uncertainty +/-0.10 mm (95%). Is the belt acceptable? Consider guard bands of 100% and 50%, and explain your result. (2 marks)
3. What do you mean by resolution of a digital image? Explain its effect on the quality of the image. (2 marks)
4. Explain the principle of irrelevancy reduction in image compression. (2 marks)

p=7	8	4
4	q=5	6
3	6	7

(2 marks)

5. Define m-connectivity. Are p and q m connected for the range {5,8} in the image? Explain why or why not. (2 marks)
6. What are the common methods of smoothing an image? Describe any one method. (2 marks)
7. Make a histogram of the 3 bit image in Fig. A, segment it, and identify the letter in it. (4 marks)

0	1	1	2	2
1	6	7	6	3
2	2	7	2	3
2	2	6	3	4

Fig. A:

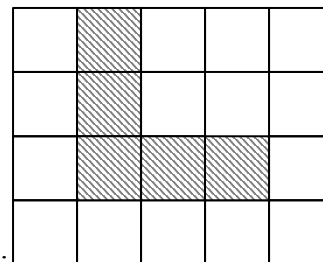


Fig. B:

8. What is an Accumulative Difference Image? Where is it used? (2 marks)
9. Construct the unique 4 directional chain code (crack) for the object in the grid of Fig. B. (2 marks)
10. Explain how objects can be recognized using Minimum Distance classifier. (2 marks)

SOLUTIONS TO NUMERICALS:

1.

u^4	dof	u^4/dof
217.4327	4	54.35818
447.7456	8	55.9682
1289.212		
dof	11.68544	
Round down	11	
t	2.2	
U	13.18268	
U+	289.1827	
U-	262.8173	

2.

Local market, hence relaxed acceptance.

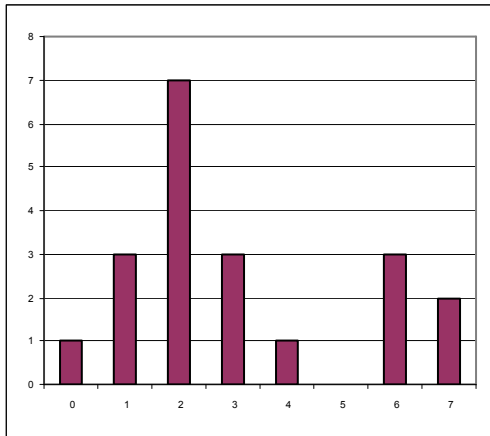
100% guardband, accept

50% guardband, reject

5.

Not connected, since 8 is in $\{5.8\}$

7.



Threshold at 5, to get letter T.

9. 00322211103