Examination Feedback for EEE6008 – Reliability and Failure
Autumn Semester 2008-09

Feedback for EEE6008 Session:2008-2009

Feedback: Please write simple statements about how well students addressed the exam paper in general and each individual question in particular including common problems/mistakes and areas of concern in the boxes provided below. Increase row height if necessary.

General Comments:

In general the performance is poorer than I expected. I am particularly surprised to find several students who failed to describe the failure mechanisms in MOSFETs due to hot carriers and gate oxide failure. Similarly in question 4 most students who attempted this question were not able to carry out the analysis using a Weibull model.

Question 1:

In this question, I expected most of you to be able to describe the drain hot carrier which causes degradation of MOSFETs. Note that this is an important effect due to the increasingly higher electric field in modern ICs as the size of MOSFETs continues to decrease but the operating voltage remains almost unchanged. Possible methods of controlling this are therefore to try to reduce the electric fields in MOSFETs or have improved design to minimize exposure to high electric field. In part (c) it was clear that most of the capacitors failed due to infant mortality since most dielectrics have breakdown fields above 1MV/cm. Therefore you should discuss possible infant mortality failure and appropriate prevention strategies.

Question 2:

Most of you did well. However many of you were not able to describe what flip-chip bonding is and discuss the advantages although these have been discussed in one of the lectures.

Question 3:

A number of you have not been able to describe the main failure mechanisms in lasers. Since this is bookwork, I was disappointed that a number of you could not answer part (a). Most students drop marks in part (d) as well. It should have been obvious to you why the laser diodes are more prone to ESD failure under reverse bias. I was expecting discussion on the difference in power dissipation. You should also have noted that the laser diodes are operated in forward bias. Therefore only ~1% will fail and this indicates that they are sufficiently well designed.

Question 4:

In this question most of you could not answer part (bii). I was expecting you to be able to recognize that the plot given is a Weibull plot. You can then use the Weibull equation for F(t) to work out the value of α. In examples that we have discussed in the class, you can find α by locating the value of t when F(t) = 0.63. Using this you can then calculate $\lambda(t)$.