Examination Feedback for EEE105 – Electronic Devices
Autumn Semester 2006-07

Feedback for EEE105 Session:2006-2007

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:

Two questions were done fairly well (2,4) and two much more poorly (1,3). The overall average was a bit lower than I had hoped, but this was pulled down by a significant minority who appeared to have made a near non-attempt at the paper. There were a number of cases where students also let themselves down by not answering the question asked.

Question 1:

Q1 Overall question was done less well than expected with too many incomplete answers to part a and poor answers on the external efficiency letting many students down here. **Q1a** Very variable answers, although most got some marks. The fact that light output power is theoretically proportional to injection current and that current exponentially rises with voltage (as for any diode) was the weakest point. **Q1b** The external efficiency part was mixed – many got the number of photons emitted. Fewer calculated the number of electrons injected. I thought wall plug efficiency would be two easy marks for all. I was surprised how many missed out. The last part was as expected with a mix of good answers and some wild guesses. **Q1c** This was not done very well. A few students who had looked at the past papers – where variants of this question exist – got it but most were hopeful guesses.

Question 2:

Q2 Overall done fairly well although I normally expect slightly higher average marks on a question that is based on the first part of the course. **Q2a** Generally done well – although many thought that the outer electrons in a metal are bound in some way to their atoms – not true for those in the metallic bonds. **Q2b** Extrinsic / Intrinsic was done fairly well although many students did not seem to appreciate exactly what was asked in part ii) and as a result lost marks. **Q2c** Very mixed – mobility is the key – anything to do with electron density changing is incorrect. **Q2d** Fairly good although some people got hung up on Centigrade vs Kelvin – not important when looking at temperature differences! **Q2e** Very difficult – one or two near misses including some answers not based on the model solution which integrated the temperature profile of the rod to get an average temperature and used the linear relationship between temperature and resistivity to advantage.

Question 3:

Q3 Generally a disaster area, mainly because of the very poor answers to part a. **Q3a** "Crash and Burn" seems to be the best adjective to describe the typical answer here. An arbitrary profile of electrons and holes at some time t=0 was given in an undoped semiconductor. The question was what happens to that profile. Many people ignored the figure or worse tried to talk about a p-n junction! Such answers typically picked up one to three marks (out of ten) for general comment but not more as they did not answer the question! **Q3b** Many students got 2/3 for this bit, but very few correctly commented that the minority carrier concentration profile was a linear decrease with distance across the base. **Q3c** Very few good answers. If one does not get dn/dx as a constant then basically it is hard to pick up many marks.

Question 4:

Q4 Either done well or very badly. For those who knew this part of the course marks of over 14 were common. **Q4a** Lots of full marks although a few forgot that the n-type is heavily doped and lost marks. **Q4b** The form of the electric field is a graph of the E-field strength with distance x. Schematics of the LED showing exposed donors and acceptors lost marks – although marking the direction of the E-field correctly and showing the depletion region to be mainly on the p-side got up to half marks. **Q4c** Answered surprisingly well for what was a fairly obscure piece of bookwork in my view – many full marks. **Q4d** The JFET was a planar device – has to be given information in question. Double junction JFETS got up to half marks for correctly identifying source drain and gate, and for noting it was a p-channel device. The calculation was done well by most, although the explanation of the reasoning behind it was often forgotten.