

ENGINEERING TRIPOS PART IIA

Tuesday 4 May 2010 9 to 10.30

Module 3B5

SEMICONDUCTOR ENGINEERING – NUMERICAL SOLUTIONS

- 1 (b) (ii) $E = \frac{\hbar^2}{2m} \left(\frac{\pi}{L} \right)^2$
- 2 (c) 2.24 μV
(d) Total conductivity = $76.9 \Omega^{-1} \text{m}^{-1}$; ratio of the electron conductivity to that of the holes is 2.9×10^{-12} .
- 3 (a) $V = 0.6 \text{ V}$
(b) $e\phi_b = 0.75 \text{ eV}$; $I = 1.25 \text{ nA}$
- 4 (c) I_{DS} is valid up to $V_{DS} = V_{GS} - V_T$.
(d) $g_m = \frac{\partial I_{DS}(sat)}{\partial V_{GS}} = -\frac{C_{ox}\mu_h FEW}{L} (V_{GS} - V_T)$