PHASM426/PHASG426 (Advanced Quantum Theory): Numerical answers for exams 2010-2014

Here I provide the numerical answers for questions in the exams of years 2010 to 2014. Notice that in 2010 important changes where introduced to the syllabus and therefore from the exam 2010 only questions 1, 2 and 4 are relevant to the current course, as already indicated in the Moodle page.

Also, notice that only very few questions from each previous exam have numerical answers.

2010 Paper:

2(e) For n=0, ratio=0.18
      For n=1, ratio= 0.53
      For n=2, ratio=0.88

2011 Paper:

5(d)(ii): Eigenvalues are λ_1=+1 and λ_2=-1

$$P_1 = \frac{1}{3}\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

$$P_2 = \frac{1}{3}\begin{pmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ -1 & -1 & 2 \end{pmatrix}$$

5(d)(iii): Probability= 1/3 and state=$\frac{1}{\sqrt{6}}\begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}$

2012 Paper:

1 (f) (i): λ=1/2

2(d): There are 2 bond states. Ground state energy= 0.38 keV

3(d): Eigenvalues are λ_1=+1 and λ_2=-1 with degeneracy 1 and 2 respectively

$$P_1 = \frac{1}{3}\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

$$P_2 = \frac{1}{3}\begin{pmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ -1 & -1 & 2 \end{pmatrix}$$

$$3(e): \frac{1}{\sqrt{6}}\begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}$$

2013 Paper:

1(d): There are 2 bond states. Ground state energy= 0.38 keV

2014: No numerical answers