INFORMATION THEORY examination   **May 2011**

General instructions

Use of books, notes and codes allowed.
Provide concise answers with short and precise justification.
Write your family name on every page you hand in,
number consecutively all pages that you hand in,
write on the first page the number of pages that you hand in.
No page should contain answers or fragments of answers to more than one question.
Please write your answers with pen or dark pencil.

Questions:

1. Construct an instantaneous binary code for an information source with
   probabilities 0.1, 0.1, 0.1, 0.1, 0.2, 0.2, 0.3 that has minimum average codeword
   length among all uniquely decipherable binary encodings of this source.

2. Is there a uniquely decipherable binary code C consisting of 17 words, all of
   length at most 15, and having the property that for every positive integer n less
   then 16 there is a word in C whose length is n ?

3. How many binary maximal instantaneous codes are there with three codewords?

4. Does a uniquely decipherable code with Kraft sum between 0.45 and 0.5 exist ?

5. Is the code consisting of the three words 0, 010, 01100 uniquely decipherable ?