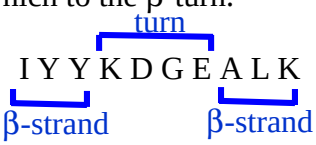
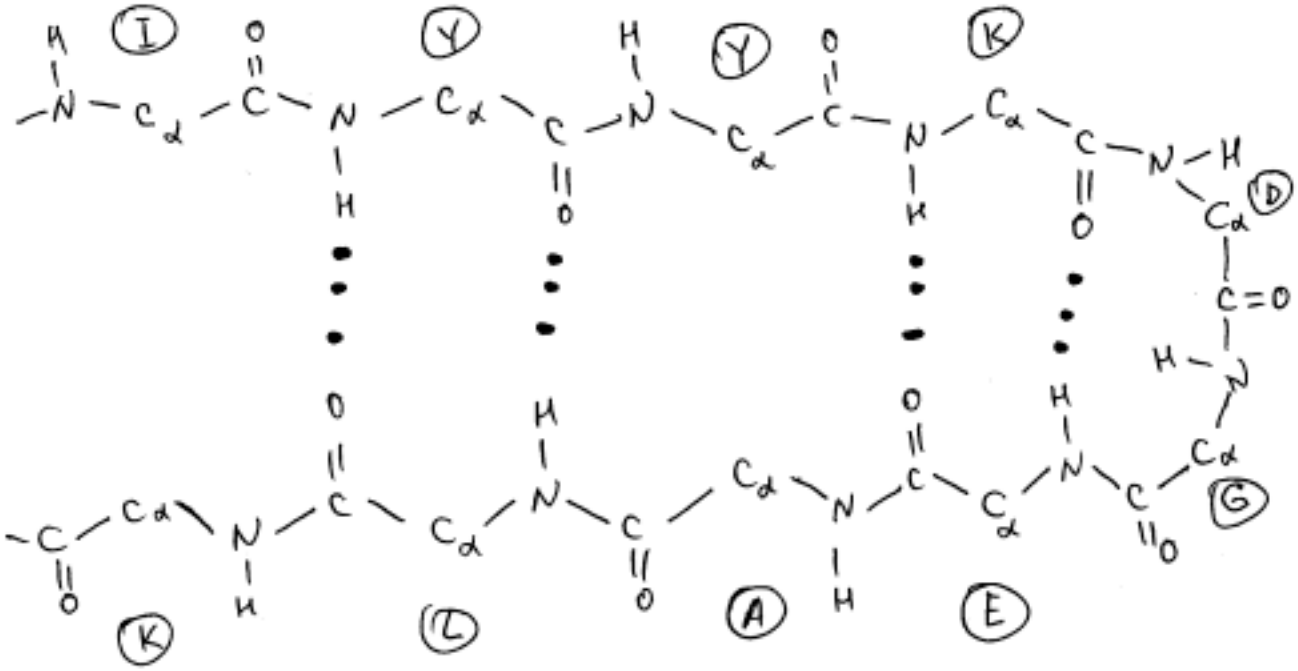
Problem 6. (12 points)
A 10-residue peptide, IYYKDGEALK, is a part of an extracellular domain of a receptor for immunoglobulin E. Studies suggest that in the context of the protein this peptide forms a β-hairpin structure, comprising two antiparallel β-strands connected by a type II β-turn.

(a) (2 points) In the peptide sequence below clearly indicate, which residues belong to the two β-strands and which to the β-turn.



(b) (4 points) How many hydrogen bonds between backbone atoms are present in the structure? Explain your reasoning.
4 hydrogen bonds.
Due to extended conformation of β-strand, hydrogen bonds between two antiparallel β-strands are between alternate residues. Since there are two H-bonds in the β-turn, between the 1st (K4) and the 4th (E7) residues, there is no hydrogen bonding between Y3 and A8, and the next pair of hydrogen bonds is between Y2 and L9 (numbering residues starting from the N-terminal I).

(c) (6 points) Draw schematically the hydrogen bonding pattern for this structure. Do not draw the side chains – just indicate the type of amino acid residue.
The main goal here was to show/understand the concept of hydrogen bonding between antiparallel β-strands A detailed drawing is shown below, however, less detailed drawings that correctly indicated the alternate pattern of H-bonding were given all the credits they deserved.