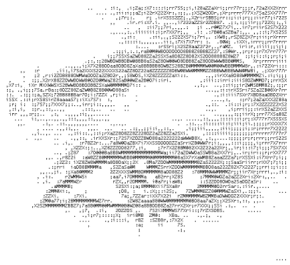
Telecom Network Systems
(SRT)
Second-call exam
03/07/2015 16:30-19:30
(Duration: 3 hours)



MIEET 4º ano

- Write your name, student number and course on all sheets you hand in.
- Talking is not allowed. If you do it, your exam will be canceled. Switch off your cellular telephone.
- If you give up, write "I Desist" on the exam sheet and hand it in.
- The exam has 7 questions and the maximum score for each is written in brackets.
- Write legible.
- Good luck!

Question 1 (2)
What is VBR and CBR?

Question 2 (4)
a) What is the Shannon Entropy of a die that has probability of throwing 1: 1/21, 2: 2/21, 3: 3/21 .. , 6: 6/21?
b) Prove that the highest entropy for an event is achieved when it has symmetric probabilities for all outcomes: $p_i = 1/N$ for all N possible outcomes. For example a dice that has a probability of 1/6 for every number thrown.

Question 3 (4)
Imagine we have 13 coins and we know that one of them is false. With three (3) measurements on a balance we want to determine which one it is. Make a decision diagram and calculate the relevant Shannon Entropies and amount of information retrieved for the first step.

Question 4 (4)
For channel coding of binary-symmetric data, we can use P^4, namely adding a parity bit to a three bit string. If a bit in the noisy channel has an error of 0.01 (1%) to arrive wrong on the other side, what is the final undetected bit-error rate of the communication?

Question 5 (2)
Explain what is Manchester coding and what it is good for.

Question 6 (2)
A certain glass fiber is made of a glass with refractive index of $n = 1.4475$.
a) What is the maximum angle of incidence of light that still has total internal reflection?

b) What would be the pulse dispersion in such a fiber of 10 km length? What is then the maximum bit rate for delta-function pulses?

Question 7 (2)
Explain what is the DCF77 code. How does it work?

---------- end ----------