Answer all the following questions

Q1. a- (8 marks) Consider the following codes:

Symbol	Code I	Code II	Code III
S0	0	0	00
S1	01	11	10
S2	011	01	111
S3	1111	11	01

For each code identify whether the code is: (i) distinct, (ii) instantaneous.

b- (12 marks) Design a code using the Shannon-Fano algorithm to encode a memoryless Source with 8 symbols using a binary encoded alphabet {0,1}, and calculate its efficiency.
A sample of the source output is:-

ABCDEDAABBCCFGGHHA

Q2. a- (8 marks) Encode the following messages using Zero suppression:

600000000002000000000003

b- (12 marks) Decode:

(0,0)a
(0,0)b
(0,0)r
(3,1)a
(4,3)c
(2,1)d
(7,4)

If it was encoded using (LZ77)

Q3.a- (8 marks) What is the minimum distance d_{min} for the set of codewords:

0001101
1110010
0110100

And how many errors can be detected d_d , corrected d_c **?**

b- (12 marks) For the given binary cascaded symmetric channels:

(i) At the output of the first channel, find: p(Y=1|X=1) , p(Y=0,X=0) , p(Y=0)
(ii) At the output of the second channel, find: p(Z=0|X=0) , p(Z=1,X=1) , p(Z=0)