## 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)


باقي الاسئلة صفحة 2

**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)