THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND COMMUNICATIONS ENGINEERING

FIRST SEMESTER EXAMINATION (2021)

EE471 INFORMATION THEORY AND CODING (BEEC/4)

TIME ALLOWED: 3 HOURS

INFORMATION FOR STUDENTS

1. You have **TEN (10) MINUTES** to read the paper.
   You must not begin writing during this time.

2. All answers must be written in the **ANSWER BOOK** supplied. **COMPLETE THE DETAILS REQUIRED ON THE FRONT COVER OF YOUR ANSWER BOOK - DO THIS NOW.**

3. Only drawing instruments and calculators are permitted on your desk.

4. Answer all questions.

5. Total available mark is 55.

6. If you are found cheating in the Examination, the penalties specified by the University shall apply.

7. **TURN OFF** all mobile phone and place them on the floor under your sit before the start of examination.

QUESTION ONE [3+2+2+2+2+2+2 = 15 MARKS]

Let X and Y having the following joint distribution of probabilities

X \ Y	0	1
0	1/2	1/4
1	0	1/2

Calculate the entropies (Show full Working):

a) H(X)

b) H(Y)

c) H(X,Y)

d) H(Y|X)

e) H(X|Y)

f) D(X||Y)

g) D(Y||X)

QUESTION TWO [5+ 5 = 10 MARKS]

A BSC has the following noise matrix with source probabilities of P(X1) = 2/3 and P(X2) = 1/3

P (Y/X) =		Y1	Y2
	X1	5/12	7/12
	X2	7/12	5/12

a) Calculate H(X) and H(Y) and shows full working.

b) Calculate the channel Capacity and shows full working.

QUESTION THREE [10 MARKS]

Calculate the channel Capacity for the given channel matrix and show full working

$P(B_j \backslash A_i) =$

	B1	B2	B3
A1	1/2	1/3	1/6
A2	1/3	1/6	1/2
A3	1/6	1/2	1/3

QUESTION FOUR [2+2+2+2+2 = 10 MARKS]

Consider the following data and answer the below questions on the concept of Hamming code: 1001101

a) How many redundant bits will be added in the given data?

b) On what positions the redundant bits will be placed in the data?

c) What will be the value of redundant bits?

d) Generate the hamming code for the above given data?

e) Explain the importance of Hamming code as error correction method?

QUESTION FIVE [10 MARKS]

Explain the Checksum as error detection method with 7, 11, 12, 0, 6 as input bits. Show the full working for sender and receiver using the given data