

ID: 2116080021

NAME: Ghulam Farhanul  
Bashar.

Final Examination  
Spring 2024

Date: 10 June 2024.

Program BSC in CSE

course code: CSE 443

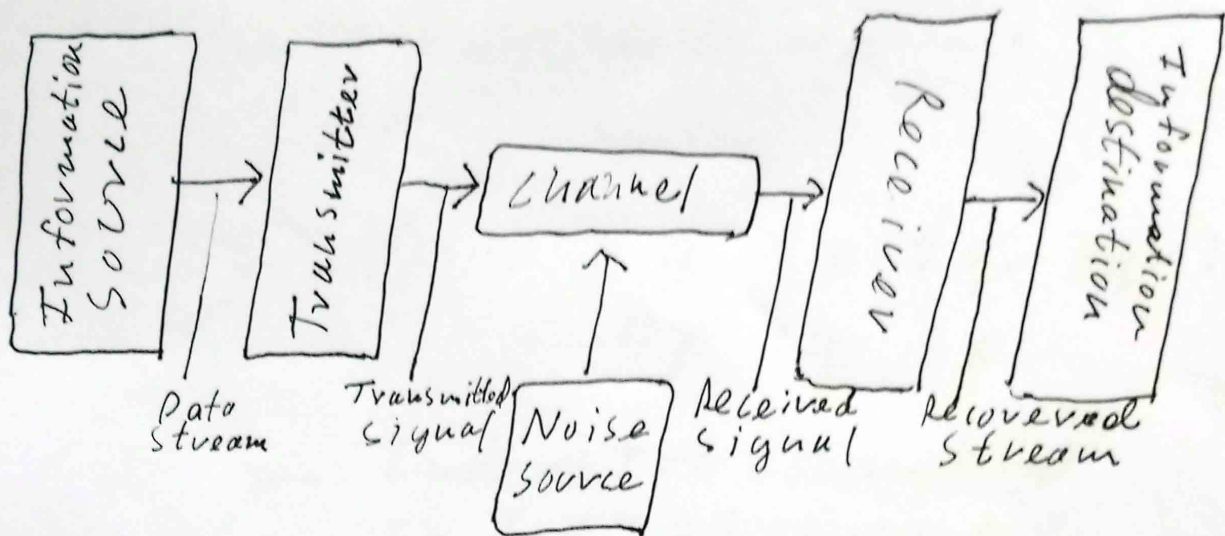
course title: Mobile and Tele-  
-communication.

Dept of CSE / CSIT

Victoria University

Bangladesh.

Ans 1) a)



A transmitter is positioned at one location and receiver is located at another location with the channel serving as a medium between the two location.

Ans 1) b) let an information source

generate messages  $m_1, m_2, m_3, \dots, m_k$  with probability of occurrence  $P_1, P_2, P_3, \dots, P_k$ . For a long observation period  $[0, T]$ ,  $L$  messages were generated therefore  $L P_1, L P_2, L P_3, \dots, L P_k$  are the number of symbols of  $m_1, m_2, m_3, \dots, m_k$  were generated over the observation time  $[0, T]$ ,

Information source  $\rightarrow \{m_1, m_2, m_3, \dots, m_k\}$   
 $\{P_1, P_2, P_3, \dots, P_k\}$

Now total information will be

$$I_T = L P_1 \log_2 (L/P_1) + L P_2 \log_2 (L/P_2) + L P_3 \log_2 (L/P_3) + \dots + L P_k \log_2 (L/P_k)$$

$$= \sum_{i=1}^k L P_i \log_2 (L/P_i)$$

Average information  
 $H = I_T/L = \sum_{i=1}^k P_i \log_2 (L/P_i)$

Average information  $H$  is called entropy

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Ans 2) a) (i)  $aaa\ bbb\ ab\ abab\ abbb\ aababab$   
 —  $aaa, bbb, ab, ab, aba, bbb, ba, aab, aba, b$  .

Ans 2) b) (ii)  $p\ q\ 2p\ 2q\ 3q\ 4p$   
 $5p\ 4q\ 6p$

— Index  $I=0$  content:  $p$   
 Index  $I=1$  content:  $q$   
 Index  $I=2$  content:  $2p$   
 Index  $I=3$  content:  $2q\ 3q$   
 Index  $I=4$  content:  $4p\ 5p$   
 Index  $I=5$  content:  $4q$   
 Index  $I=6$  content:  $6p$  .

Ans 4) a)

Message	Probability
$m_1$	0.4
$m_2$	0.2
$m_3$	0.12
$m_4$	0.08
$m_5$	0.08
$m_6$	0.06
$m_7$	0.06

Ans 4) a)

Shannon  
- Fano  
code

Message	Probability ( $\log(1/p)$ )
m6	0.06
m7	0.06
m4	0.08
m5	0.08
m3	0.12
m2	0.2
m1	0.4

$$\text{efficiency} = \frac{H}{L}$$

length = L  
Average information = H

$$H = 0.06 \log\left(\frac{1}{0.06}\right) + 0.06 \log\left(\frac{1}{0.06}\right) + 0.08 \log\left(\frac{1}{0.08}\right) + 0.08 \log\left(\frac{1}{0.08}\right) \\ + 0.12 \log\left(\frac{1}{0.12}\right) + 0.2 \log\left(\frac{1}{0.2}\right) + 0.4 \log\left(\frac{1}{0.4}\right)$$

$$= 0.0733 + 0.0733 + 0.0877 + 0.0877 + 0.1105 + 0.1398 + 0.1592 \\ = 0.59976$$

$$L = (-0.1466) + (-0.1755) + (-0.1105) + (-0.1398) + (-0.1592) \\ = 0.7316$$

$$\text{efficiency} = \frac{0.59976}{0.7316} = 0.8198$$

Aus 5) a)

7	0.0005	4000					
6	0.00011	487.8089					
5	0.0250	80					
4	0.1250	16	0.125				
3	0.5	4	0.5				
2	1.5	1.3333	1.5000	1.3333			
1	3	0.6666	3.0000	0.6666			
0	3	2	1	2	1		
3	2	1	0.3333	0.0833	<del>0.0277</del>	<del>0.0077</del>	<del>0.0022</del>
0	1	2	3	4	5	6	7

QoS of each fragfil