

# Unit 9 - Principles of OFDM Wireless Communication

## Course outline

### How to Access the Portal ?

### Introduction to Wireless Systems

### Performance in Fading wireless channels

### Multiple Antenna Wireless Systems and Diversity

### Wireless Channel Characterization - Delay Spread and Doppler

### Principles of CDMA Wireless Communication

### Principles of CDMA and MIMO Wireless Communication

### Principles of MIMO Wireless Communication (Continued)

### Principles of OFDM Wireless Communication

 Capacity of MIMO Wireless Systems

 SVD based MIMO Transmission

 Orthogonal Frequency Division Multiplexing (OFDM)

 Transmission in Multicarrier Systems

 FFT/IFFT Processing in OFDM

 Cyclic Prefix in OFDM Systems

 Schematic Representation of OFDM Transmitter and Receiver

 BER Performance of OFDM Systems

 Quiz : Assignment-8

 Solution - 8

### Text Transcription

### Unit-0

## Assignment-8

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2019-10-23, 23:59 IST.**

1) Orthogonal Frequency Division Multiplexing (OFDM) in a wireless system aims to overcome 1 point

- Time-Varying Channel
- Inter-symbol Interference
- Multi-path propagation
- Multi-user Interference

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
*Inter-symbol Interference*

2) Consider a bandwidth  $B = 20$  MHz and number of subcarriers  $N = 1024$  in an OFDM system. The OFDM symbol time without cyclic prefix is approximately given as 1 point

- 51.2  $\mu s$
- 39 ns
- 25.6  $\mu s$
- 1.56  $\mu s$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
51.2  $\mu s$

3) Consider an OFDM frequency selective channel with channel taps  $h(0), h(1), h(2), h(3), h(4)$ . Let the number of subcarriers be equal to  $N$  and cyclic prefix be of length 5. With cyclic prefix, the symbol  $y(2)$  corresponding to the output at time instant 2, for a noiseless scenario, is given as, 1 point

- $h(0)x(0) + h(1)x(-1) + h(2)x(-2) + h(3)x(-3) + h(4)x(-4)$
- $h(0)x(0) + h(1)x(1) + h(2)x(2) + h(3)x(3) + h(4)x(4)$
- $h(0)x(2) + h(1)x(1) + h(2)x(0) + h(3)x(N-1) + h(4)x(N-2)$
- $h(0)x(2)$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $h(0)x(2) + h(1)x(1) + h(2)x(0) + h(3)x(N-1) + h(4)x(N-2)$

4) Consider an OFDM system with channel taps  $h(0) = 1 + 2j, h(1) = 2 - j$  in a system with  $N = 4$  subcarriers. The coefficient  $H(3)$  for subcarrier  $k = 3$  is given as 1 point

- $3 - j$
- $1 + 2j$
- $2 + 4j$
- $2 - 4j$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $2 + 4j$

5) Consider an OFDM system with  $N = 512$  subcarriers and noise variance  $\sigma^2 = 3$  dB at the input of the FFT. The noise variance at the output of the FFT is 1 point

- 27.1 dB
- 30.1 dB
- 33.1 dB
- 32 dB

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
30.1 dB

6) Consider an OFDM system with  $L = 32$  IID Rayleigh fading channel taps of average power 2,  $N = 512$  subcarriers, SNR = 75 dB. The BER of the OFDM system is given approximately as 1 point

- $1.26 \times 10^{-7}$
- $1.26 \times 10^{-8}$
- $2.53 \times 10^{-7}$
- $2.53 \times 10^{-8}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $1.26 \times 10^{-7}$

7) If the number of subcarriers is  $N = 1024$  and the bandwidth  $B = 10$  MHz. If the cyclic prefix consists of 125 samples, what is the total OFDM symbol time without and with cyclic prefix respectively? 1 point

- 102.4  $\mu s, 115.2 \mu s$
- 102.4  $\mu s, 124.2 \mu s$
- 102.4  $\mu s, 119.4 \mu s$
- 102.4  $\mu s, 114.9 \mu s$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
102.4  $\mu s, 114.9 \mu s$

8) Consider an OFDM system with noise power  $\sigma^2 = -3$  dB, number of channel taps  $L = 16$ , number of subcarriers  $N = 1024$ , transmit power  $P = 30$  dB. If each channel tap is IID Rayleigh with average power 3, i.e.  $E\{|h(i)|^2\} = 3$ , what will be the SNR at the receiver? 1 point

- 17.19 dB
- 19.71 dB
- 16.70 dB
- 22.72 dB

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
19.71 dB

9) Consider an OFDM system with noise power  $\sigma^2 = 3$  dB, number of channel taps  $L$ , number of subcarriers  $N = 256$ , transmit power  $P = 50$  dB. If each channel tap is IID Rayleigh with average power 2, i.e.  $E\{|h(i)|^2\} = 2$ , then for BER =  $5 \times 10^{-5}$  in this OFDM system what can be the closest approximate about the value of  $L$ ? 1 point

- 18
- 24
- 29
- 26

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
26

10) OFDM is used in which of the following wireless standards 1 point

- WCDMA
- HSDPA
- 1xEVDO
- None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
*None of the above*