NPTEL Online Certification Courses

Indian Institute of Technology Kharagpur

Course: Signal Processing for mm Wave communication for 5G and beyond

Assignment:

Week -2

TYPE OF QUESTION: MCQ/MSQ

Number of questions: **10** **Total mark: 10 X 1 = 10**

Q.1 In the channel model (analog view), while we discard the RF part, the coefficient(s) of the channel becomes

a. Real and continues
b. Complex and continuous
c. Real and discrete
d. Complex and discrete

Answer: b. Complex and continuous

Explanation: Analog view and RF view of the channel is similar except the reason that the channel coefficients become complex. For more details, see lecture 06, week 2.

Q.2 The last block of analog circuitry in the receiver for getting the digitized data is composed of

a. 1 ADC
b. 1 DAC
c. 2 ADC
d. 2 DAC

Answer: c. 2 ADC
Explanation: We need 2 ADC as we have complex data from the analog output.

Q.3 Assume that, r=10m, and f=0.1 THz, what will be the value of the transfer function due to spreading loss is given by

a. Hs= $\frac{3}{4\pi} \times 10^{-4}$
b. Hs= $\frac{3}{4\pi} \times 10^{-10}$
c. Hs= $\frac{3}{4\pi} \times 10^{-5}$
d. Hs= $\frac{3}{4\pi} \times 10^{-6}$

Answer: a. Hs= $\frac{3}{4\pi} \times 10^{-4}$

Explanation: See lecture 06, and the reference.

Q.4: The Fresnel reflection coefficient (γ) is related to Rayleigh roughness (ρ) and reflection coefficient (r) by Fresnel equation as

a. $\gamma = \frac{\rho}{r}$
b. $\gamma = \rho \times r$
c. $\gamma = \exp(\rho \times r)$
d. $\gamma = \frac{r}{\rho}$

Answer: d. $\boldsymbol{\gamma = \frac{r}{\rho}}$
Explanation: See the reference, as shown in lecture 6.

Q. 5: For a distance of 5m, the average of the coherence band-width drops from 3.42 GHz to

a. 2.56 GHz
b. 1.75 GHz
c. 2.17 GHz
d. 1.47 GHz

Answer: d. 1.47 GHz
Explanation: See the reference, as shown in lecture 6.

Q.6: In the digital view of channel model, say $S_b[m] = \mathrm{H(z)Y_b}[m]$, for a fixed number of channel taps (given a threshold), the channel can be approximated as

a. Digital IIR Filter
b. Digital FIR filter
c. All pass filter
d. None

Answer: b. Digital FIR filter
Explanation: See, in lecture 7.

Q.7: The process of interpolation in digital sampling for wireless channel model, comprises of

a. Down sampling and High pass filtering
b. Down sampling and low pass filtering
c. Up sampling and high pass filtering
d. Up sampling and low pass filtering

Answer: d. Up sampling and low pass filtering
Explanation: See, in lecture 7.

Q.8: The key similarity/difference between RF and Digital view for Channel model is

a. RF sampling is non-uniform and Digital sampling is also non-uniform
b. RF sampling is uniform and Digital sampling is non-uniform
c. RF sampling is non-uniform and Digital sampling is uniform
d. RF sampling is uniform and Digital sampling is also uniform

Answer: c. RF sampling is non-uniform and Digital sampling is uniform
Explanation: See, in lecture 7.

Q.9: Consequence of a high sampling digitally, the impact in the RF channel taps is

a. The number of RF channel taps increases
b. The number of RF channel taps decreases
c. The number of RF channel taps remain same
d. Both digital taps and RF taps increase in number

Answer: c. The number of RF channel taps remain same.
Explanation: See, in lecture 8.

Q.10: The different time-delay in a channel is given by {1us, 2us, 5us, 8us}. The 3-dB coherence bandwidth of the channel is (us represents microseconds)

a. 62.5 KHz
b. 6.25 KHz
c. 250 KHz
d. 25 KHz

Correct Answer: a. 62.5 KHz

Explanation**:** The 3-dB coherence bandwidth is expressed as $C_b = 1/(2 * \tau_m)$, where τ_m is the maximum delay.