NPTEL Online Certification Courses Indian Institute of Technology Kharagpur

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

Assignment- Week 0

TYPE OF QUESTION: MCQ/MSQ

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

MCQ/MSQ Question

QUESTION 1:

A time limited continuous square wave has

a. Finite spectrum.
b. Infinite spectrum.
c. spectrum only at f=0.

d. None of the above.

Correct Answer: a. Finite spectrum.

Detailed Solution: Digital Signal Processing (John.G.Proakis,Dimitris G.Manolakis)

QUESTION 2:

For a system model for the input signal X(N) out put is defined by Y(n)=n*X(n). The system is

a. Linear and time invariant
b. Nonlinear and time invariant.
c. Linear and time variant

d. Nonlinear and time variant.

Correct Answer: b. Nonlinear and time invariant.

.

Detailed Solution: Digital Signal Processing (John.G.Proakis,Dimitris G.Manolakis)

QUESTION 3:

Considering free space propagation, if the distance between transmitter and receiver, ***r*** is increased then

a. Electric field is decreases as r^{-1} and power per square meter decreases as r^{-2}
b. Electric field is decreases as $\boldsymbol{r^{-2}}$ and power per square meter decreases as $\boldsymbol{r^{-1}}$
c. Electric field is increases as $\boldsymbol{r^{-1}}$ and power per square meter increases as $\boldsymbol{r^{-2}}$
d. Electric field and power do not change with the distance.

.

Correct Answer: a.

Detailed Solution: Fundamentals of wireless communication (David TSE)

QUESTION 4:

If the Fourier transform of a signal z(t) is Hermitian about the frequency, f=0, then it corresponds to

a. z(t) is real valued function
b. z(t) is complex valued function
c. z(t) can take any value
d. None of the above

Correct Answer: a.

.

Detailed Solution: Digital Signal Processing (John.G.Proakis,Dimitris G.Manolakis)

QUESTION 5:

What is the wavelength of an electromagnetic signal of frequency 600Ghz? (consider the nearest approximate value)

a) 5 mm
b) 0.5 mm
c) 50 mm
d) 500 mm

Correct Answer: b.

.

Detailed Solution: Wavelength= velocity/frequency= 3*10^8/(600*10^9) meter= 0.0005 meter=0.5milimeter

QUESTION 6:

X is a circular symmetric random variable that follows gamma distribution. if I multiply the random variable by $e^{j\Theta}$ ($\Theta$is some real constant), then the distribution of the new random variable will be

a) Nakagami distribution.
b) Gaussian distribution.
c) Uniform distribution.
d) Gamma distribution.

Correct Answer: d

.

Detailed Solution: Circular symmetric indicates the distribution does not change by multiplying a phase factor $e^{j\Theta}$.

QUESTION 7:

According to central limit theorem, properly normalized sum of random variables tends to normal distribution given the condition

a. They are identical.
b. They are independent.
c. They are identical and independent.
d. They are identical but not independent.

Correct Answer: c.

Detailed Solution: Central limit theorem is valid for independent and identically distributed random variables.

QUESTION 8:

Calculate the minimum sampling rate to avoid aliasing for x(y)=5cos(100πt)

a. 50 Hz
b. 100 Hz
c. 200 Hz

d.25 Hz

Correct Answer: b.100Hz

Detailed Solution: Frequency component in the signal ,f=(100π/2π)=50Hz.
So to avoid aliasing we need to sample at f_c=50*2 Hz=100Hz(Nyquist criterion).

QUESTION 9:

A random process is stationary in weak sense if

a. Autocorrelation does not change by time shift.
b. Mean does not change with time shift
c. Both a & b.

d. Probability density function does not change with time shift.

Correct Answer: c

Detailed Solution: A process is weak sense stationary when its mean and autocorrelation is independent of time shift. Its weaker condition than strict sense stationary process.

QUESTION 10:

The autocorrelation function of additive white gaussian noise is

a. Unit step function.

b. Sinusoidal function.
c. Delta function.

d. Ramp function.

Correct Answer: c.

Detailed Solution: Autocorrelation function is inverse Fourier transform of power spectral density. Whit noise has a power spectral density that is equal for each frequency component and can be defined as $N(w)= N_{0,}$ for $-\infty<f<\infty$. The inverse fourier transform of this function is a delta function.