COURSE NAME:

Signal Processing for mm Wave communication for 5G and beyond

Assignment- week 8

Type of Questions: MCQ

Number of Questions: 10 Total Marks:10*1=10

1. If we provide different data points (QPSK constellation) to each of the elements of antenna array in mm wave system, the corresponding beampattern will depend on
   a) Antenna array spacing.
   b) Direction of signal departure.
   c) Phase of constellation points.
   d) All of the above.

   Correct answer: d)

   Detailed solution: lecture 39

2. A mm wave MIMO system has a total of M data stream being applied to the phase shifter as input and N receiver antenna in the receiver side. Suppose the antenna array in transmitter side is using 6 antennas for transmitting data from a particular data source to obtain beamforming techniques. The number of directed beams will be
   a) M.
   b) N.
   c) M/6.
   d) N/6.
   Correct Option: a)
   Detailed solution: Lecture 42.
3. In mm wave MIMO system, the beam steering in the transmitter side is done by
   a) Rotating the antenna position.
   b) Applying relative phase shift in antenna array elements.
   c) By switching the antenna array elements.
   d) None of the above.
   Correct Option: b)
   Detailed solution: lecture 40
4. In mmwave MIMO system, the advantage of MIMO system is claimed by
   a) Sending every beam pattern of transmitter side to each antenna in receiver side.
   b) Mixing weighted sum of original data vector in baseband and applying it as input signal vector of steering vector.
   c) Sending a particular input data to a destined receiver antenna using beamforming techniques.
   d) Switching off every antenna, while one of the antennas is transmitting.
   Correct Option: b)
   Detailed solution: Lecture 42
5. The RF precoder in transmitter side is
   a) Fat matrix.
   b) Tall matrix
   c) Full rank matrix.
   d) Any of the above.

Correct option: b)
Detailed solution: lecture 40

6. Digital precoder in transmitter side for mm wave MIMO system is used to
   a) Beam steering.
   b) Beamforming.
   c) For mixing the input data so that every receiver receives weighted sum of all the input vectors.
   d) All of the above.
   Correct option: c)
   Detailed solution: lecture 43
7. From the implementation point of view in hybrid beamforming, the phase shifter lies in
   a) RF domain.
   b) Analog domain.
   c) Digital domain.
   d) None of the above.
   Correct Option: a)
   Detailed solution: lecture 43.
8. For a mmwave single input multiple output system, the equalizer part is done in
   a) LNA
   b) Phase shifter.
   c) In DSP domain after DAC.
   d) Both a) and b).
   Correct answer: d)
   Detailed solution: lecture 44
9. A mm wave MIMO system has 5 input data streams into the input of digital precoder in transmitter side. The number of receiver antenna is 6 and the equalizer matrix has a dimension 6×6. How many numbers of phase shifter is required in RF side to design the equaliser?
   a) 24.
   b) 12.
   c) 30.
   d) 36.
   Correct Answer: 36.
   Detailed solution: lecture 45.
10. Suppose a mm wave system has 5 input data streams in the input of digital precoder. Each data is coming from a QPSK constellation. Number of elements in the search space (hypothesis) for ML detection algorithm in receiver side will be
    a) 625.
    b) 1024.
    c) 3125.
    d) 256.
    Correct answer:b)
    Detailed solution: Number of constellations point in QPSK=4. There are 5 input data streams. So total number of search point= 4^5=1024. (lecture 46)