JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Test-2 (April, 2016)

Department of Electronics and Communications Engineering

M.Tech. (Fourth Semester)

Course Code: 13M1WEC432   Duration: 1 hour 30 minutes

Course Name: Radar and Sonar signal processing   Maximum Marks: 25

Note: Answer all questions. Specify the assumptions, if made any. Marks are indicated in parenthesis. Carrying the mobile phone during the examinations will be treated as a case of unfair means.

1. Derive the expression for the radiation resistance of a very short dipole antenna.   (4)

2. Obtain the excitation coefficients for the antenna array to have no radiation at all in 45^0, 90^0 and 120^0. What happens if the distance between the antenna elements that you assumed is doubled? How do you find the beam width between first nulls?   (4)

3. What do you mean by image frequency and how do you avoid the image frequency in up conversion and down conversion.   (4)

4. Draw the block diagram of the Doppler radar and explain in brief about the components used in it.   (4)

5. A mono-static radar has to operate at $3GHz$. This system has to receive a signal from the object at $100Km$ with the radar cross section of $1m^2$. The effective aperture are of the antenna is $1m^2$ and efficiency is 80%. Find the required power that has to be transmitted to detect the target without any problem. Give the ratio of transmitted power and received power. Specify the assumption.(4)

6. Explain the following briefly.   (5)

   a. Broadside antenna array.

   b. Electronic beam-steering in radar.

   c. Radar cross section.

   d. Noise figure of cascaded systems.

   e. Polarization of electromagnetic waves.