Mansoura Univerdity | **Antennas**
Faculty of Engineering | **M Sc Exam**
Dept. of Electronics & Electrical Comm. | **Time allowed: 3 Hours**

Answer the following questions; assuming any missing data.

1) A linearly polarized wave traveling in the negative z-direction is incident upon an elliptically polarized antenna (either CW or CCW). Te axial ratio of the antenna polarization ellipse is 2:1 and its major axis coincides with the principal x-axis. Find the polarization loss factor (PLF) assuming the incident wave is linearly polarized in the:
   a) x-direction.
   b) y- direction.

2) A magnetic field strength of 5μA/ m is required at a point on $\theta=\pi/2$, 2km from an antenna in air. Neglecting Ohmic loss, how much power must the antenna transmit if it is:
   a- A hertzian dipole of length $\lambda/25$
   b- $\lambda/2$ dipole
   c- $\lambda/4$ monopole
   d- A 10-turn antenna of radius r= $\lambda/20$.

3) A very small ($a<<\lambda$) circular loop of constant current is placed a distance h above an infinite electric ground plane. Assuming z is perpendicular to the ground plane, find the total far-zone field radiated by the loop when its plane parallel to:
   a) x-z plane
   b) y-z plane

4) Design a 3-element uniform linear scanning array with a spacing of λ /4 between the elements.
   a) What is the progressive phase excitation between the elements so that the maximum of the array factor is 30^{o} from the line where the elements are placed?
   b) What is the half-power beamwidth (in degree) of the array factor of part a?
   c) What is the value (in dB) of the maximum of the first lobe?

5) Design a resonant cylindrical stub monopole of length *l*, diameter d, and *l*/d of 50. Find the length (in λ), diameter (in λ), and the input impedance at the first four resonances.