
CURRENT PLACEHOLDER, SOME SUMMARY HAS EMOJI PLEASE HELP REMOVING THEM

| Category | # Ques- tions | Description | Typical Questions |
|---|---------------------|---|--|
| Side Ques- tions (Conceptual Theory) | 13 | Key oral theory concepts: phase center, grating lobes, mutual coupling, miniaturization, and CEM methods. | - What is the phase center? - What are grating lobes? - What's the Wheeler-Chu limit? - What's the difference between DE and IE methods? - Why is miniaturizing antennas difficult? - What is mutual coupling? |
| Antenna Fundamentals (λ, f, Friis, Gain) | 6 | Core topics: frequency-wavelength, Friis, gain, effective area. | - What is the wavelength at 3GHz? - Derive and explain the Friis equation. - How can $P_r > P_t$ be explained? - Can aperture efficiency exceed 1? |
| Scattering & Electromagnetic Theory | 5 | Modeling materials in EM fields, relation of scattered and total fields. | - What happens when a scatterer is a PEC or dielectric? - Solve $E_{tot} = E_{inc} + E_{scat}$. - Describe the role of induced currents. |
| Slot and Microstrip Antennas | 5 | Radiation from slots, patch resonance, equivalence use. | - Explain how a microstrip antenna works. - What resonates and in which direction? - Use equivalence theorem to analyze a slot. |
| Dipole and PEC Image Problems | 4 | Image theory and PECs affecting dipole fields. | - Draw the image of a dipole over PEC. - What is the far field of a dipole near PEC? - What height gives optimal directivity? |
| Far Field Radiation & Antenna Patterns | 4 | Calculate radiated E and H fields from simple sources. | - Use elementary dipole formulas to find far field. - What is the pattern in the $\phi = \pi/2$ plane? - Derive $F(r)$ for a radiating dipole. |

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|---|---------------------|---|--|
| Nulls and Directivity | 4 | Placing nulls, shaping beam with geometry and phase. | - Find smallest h to get a null at $\theta = 60^\circ$. - How can antenna placement create nulls? - Optimize h for main lobe targeting. |
| Equivalence Theorems & Boundary Conditions | 3 | Use of surface equivalence and physical meaning of boundary conditions. | - What does the equivalence theorem state? - Explain surface currents at PEC. - Why must E and H fields be continuous? |
| Uniform Linear Array (ULA) Theory | 2 | Element count vs pattern shaping, gain, and aperture. | - What happens to main lobe as $N \rightarrow \infty$? - How do grating lobes appear? - Prove scaling laws for gain and aperture. |
