**MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE  
REPUBLIC OF UZBEKISTAN**

**TASHKENT MUHAMMAD AL-KHORAZMIY UNIVERSITY OF INFORMATION  
TECHNOLOGIES**

**Faculty of Radio and Mobile Communications**

**Department of Broadcasting Systems**

**Antennas and Wave Propagation Discipline**

**Control questions**

**In the final control each student is planned to be asked 3 questions, the tasks for each  
question are divided into blocks below**

Cluster I

1. Properties and parameters of radio waves
2. Frequency range of radio waves
3. Mechanisms of radio wave propagation
4. Radio wave propagation in free space
5. Radio wave propagation losses in free space
6. Features of the radio path of the first type. Power at the receiver input
7. Features of the radio path of the second type. Power at the receiver input
8. Calculation of electric field strength in free space
9. Fresnel zones
10. Calculation of Fresnel zone radii
11. Peculiarities of construction of radio relay mobile communication lines
12. Raised antennas. Concept and characteristics of raised antennas
13. Peculiarities of terrestrial VHF propagation
14. Division of the radio route into zones
15. Peculiarities of radio wave propagation in the illumination zone
16. Interference formula for calculating the attenuation multiplier of terrestrial VHFs
17. Calculation of distances of maximum electric field strength maxima of terrestrial VHFs in the illumination zone
18. Calculation of distances of minimum electric field strength minima of terrestrial VHFs in the illumination zone
19. The concepts of reflection modulus and phase loss angle in the calculation of VHF terrestrial attenuation multiplier
20. Calculation of line-of-sight distance of terrestrial VHF propagation
21. The troposphere and its properties
22. Tropospheric parameters
23. Tropospheric refraction
24. Negative refraction
25. Positive refraction
26. Superrefraction
27. The concept of the equivalent radius of the Earth
28. The impact of urban architecture on mobile phone signal propagation.
29. Radio wave propagation models for mobile communications
30. Radio wave scattering
31. Diffraction of radio waves
32. Refraction of radio waves
33. Radio wave absorption
34. Satellite mobile phone lines
35. Satellite radio link structure
36. Advantages of satellite communication
37. Disadvantages of satellite communications
38. Orbits of artificial Earth satellites
39. Features of the geostationary orbit
40. Features of low-orbit communication lines

II cluster of issues

1. Antenna as a radio technical device. Purpose of antennas
2. Classification of antennas according to the principle of formation of the radiated field
3. Classification of antennas by range properties
4. Classification of antennas by directional properties
5. Parameters characterising directional properties of antennas
6. Parameters characterising electrical properties of antennas
7. Antenna directivity diagram. Parameters and characteristics
8. Symmetrical vibrator design
9. Principle of operation of a symmetrical vibrator
10. Parameters of symmetrical vibrator
11. Current amplitude distribution on the arms of a symmetrical vibrator
12. Dependence of the directional pattern of a symmetrical vibrator on the current distribution on its arms
13. Ways to increase the range properties of a symmetrical vibrator
14. Pin antenna
15. Pin antenna characteristics
16. Pin antenna power supply
17. A system of two coupled vibrators. Concept and design
18. Reflector and director properties
19. Dependence of directional properties of coupled vibrators on their parameters
20. Design and principle of operation of the director antenna
21. Purpose of the reflector and director in a director antenna
22. Influence of the number of directors and reflectors on the directional properties of a director antenna
23. Design and principle of operation of the logoperiodic antenna
24. Active area of the logoperiodic antenna
25. Period of the logoperiodic antenna structure
26. Panel antennas for mobile communications
27. Design features, parameters and characteristics of panel antennas
28. Formation of narrow directional patterns using antenna arrays
29. Directional pattern control using antenna arrays
30. Calculation of the directivity characteristic of a linear in-phase transverse radiation antenna array
31. Calculation of the directivity characteristic of a linear non-synchronous antenna array
32. Excited surface radiation
33. The concept of an ideal excited site
34. Influence of amplitude distribution on the directional properties of the excited site
35. Phase errors on the excited site. Their influence on the directional properties of the site
36. Directional action coefficient of an ideal excited site
37. Directional action coefficient of the real excited site
38. Surface utilization factor
39. Design and principle of operation of a parabolic antenna
40. Straight-focus parabolic antenna
41. Offset parabolic antenna
42. Double mirror parabolic antenna by Cassegrain scheme
43. A two-mirror parabolic antenna based on the Gregory scheme
44. Shadow effect of a parabolic antenna
45. Response of a mirror to a parabolic antenna radiator
46. Requirements for parabolic antenna mirrors
47. Requirements for parabolic antenna irradiators
48. Peculiarities of computer modelling of antennas using the program MMANA
49. Main windows of the MMANA program
50. Peculiarities of measurements of antenna parameters and characteristics

Cluster III

1. Determine the efficiency of the antenna-feeder path, if the KND of the antenna is equal to ... , and its CG is equal to
2. Determine the CHP of an antenna if its KND is ... , and its efficiency is
3. The antenna has an overlap coefficient of Its minimum operating frequency is

Determine its maximum operating frequency

1. Determine the resonant frequency of a half-wave symmetrical vibrator with arm length ...
2. Determine the efficiency of the antenna-feeder path of the antenna, if the power supplied to it is equal to ... and the power radiated by it is equal to
3. Determine the period of the structure of the logoperiodic antenna, if in the active zone the length of the previous (smaller) vibrator is equal to ... , and the length of the next (larger) vibrator is equal to
4. Determine the main lobe width at zero radiated power of a linear antenna array that consists of ... elements, operates at a frequency of ... , and the distance between them is ... , and the distance between them is
5. Determine the KND of an ideal radiating pad with dimensions a = ... , b = ... , operating at frequency
6. Determine the instrumentation of a radiating site if its effective area is ... square metres and its geometric area is ... square metres
7. Determine the length of the resonant vibrator in the active area of a logoperiodic antenna at frequency ...

**U.A. Umarov**

**Teacher**