Non Euclidean Geometries-Exam questions

1. Axiomatic construction of n-dimensional Euclidean space. Axioms of the I group.
2. Axiomatic construction of n-dimensional Euclidean space. Axioms of the II group.
3. Axiomatic construction of n-dimensional Euclidean space. Axioms of the III group. Vector coordinates relative to the basis. Coordinates of the sum of two vectors and the multiplication of a vector by a number.
4. Axiomatic construction of n-dimensional Euclidean space. Axioms of the IV group.
5. The length of a vector in Euclidean space, the angle between two vectors. The Cauchy-Bunyakovsky inequality.
6. m-dimensional plane in n-dimensional Euclidean space, vector equation of m -dimensional plane.
7. line and hyperplane as special cases of the m -dimensional plane. Coordinate hyperplane equations.
8. Specifying a hyperplane by linear equations in space R_n, tangential coordinates.
9. Transformation of motion in space R^n. Substantiation of the fact that during motion the image of a hyperplane is a hyperplane.
10. Establishment of images of a straight line and m -plane during motion in space R^n. Motion as an affine transformation.
11. Establishment of independent parameters of motion in space R^n.
12. Axiomatic construction of pseudo-Euclidean space ${}^{\ell}R_n$. Length of a vector in space ${}^{\ell}R_n$.
13. Orthonormal basis in space ${}^{\ell}R_n$.
14. Isomorphism of spaces ${}^{\ell}R_n$ and ${}^{n-\ell}R_n$.
15. m -dimensional planes in pseudo-Euclidean space ${}^{\ell}R_n$, their types.
16. Interpretation of vectors of real length, imaginary length and zero length of plane ${}^{1}R_2$ in plane R_2.
17. The concept of a circle in a plane ${}^{1}R_2$. Interpretation of circles of real radius, imaginary radius and zero radius of this plane in plane R_2.
18. The concept of a hypersphere in spaces R^n and ${}^{\ell}R_n$. Perpendicularity of the differential of the radius vector of the current point to itself.
19. Interpretation of hyperspheres of real radius, imaginary radius and zero radius of space ${}^{1}R_3$ in space R_3.
20. Construction of a model of the Riemannian plane S_2 using the sphere of space R_3. Points and lines of the Riemannian plane.
21. Distinctive properties of the Riemannian plane and the Euclidean plane.

22. Types of beams of straight lines in the Lobachevsky plane.
23. Basic properties of a circle in the Lobachevsky plane.
24. Equidistant line on the Lobachevsky plane, the theorem on the intersection of a straight line with equidistant line.
25. Basic properties of the equidistant line on the Lobachevsky plane.
26. The concept of an equidistant line on the Lobachevsky plane, an equidistant line as an orthogonal trajectory of a bundle of diverging straight lines.
27. Axiomatic construction of *n*-dimensional projective space.
28. Determination of line and plane in three-dimensional projective space.
29. The property that one straight line belongs to two points on the projective plane.
30. The property that a straight line belongs to a plane in three-dimensional projective space.
31. Property on the intersection of any two projective lines on the projective plane.
32. Projective frame on the projective plane, vertices, unit point and coordinate lines of the projective frame. Consistent vector system.
33. Determining the projective coordinates of a point on the projective plane.
34. collineation transformation in *n*-dimensional projective space, its coordinate and vector expressions.
35. Collineation group in *n*-dimensional projective space.