List of questions and tasks that can be found in the examination tickets from the discipline of ELECTRIC MACHINES

1. Classification of transformers.
2. Purpose, design, principle of operation of three-phase transformers. Types of transformer cooling.
3. Design and purpose of transformer cores and windings.
4. Wiring diagrams of three-phase transformers, efficiency of the transformer, short-circuit voltage.
5. Classification of transformers by design and number of windings per phase.
6. Circuits and windings groups of connection of three-phase powerful transformers.
7. Wiring diagrams of three-phase transformer windings. When is the zigzag scheme used?
8. Groups of three-phase transformers windings connection. Name the conditions for turning on transformers for parallel operation.
9. How and why to conduct an experiment of non-operating transformer. What is found in this experiment?
10. Carrying out and appointment of the transformer short circuit laboratory test.
11. Determination of the transformer nominal parameters based on the results of experiments of idling and laboratory short circuit.
12. Cooling systems for powerful transformers. Assignment of the main elements of the transformer cooling system oil tank.
13. Conditions for including transformers for parallel operation. Analyze the non-fulfillment of one of the conditions.
14. External characteristics of the transformer. Welding transformers.
15. Design and principle of the welding transformer operation.
16. Losses and calculation of transformer efficiency.
17. Magnetic asymmetry of the powerful transformers core. How do you deal with this?
18. The principle of electric machines reversibility. Design and principle of an induction motor operation.
19. Creation of electromagnetic fields in AC machines.
20. Series of asynchronous machines.
21. What is the slip of an asynchronous motor? In what range does the slip change?

22. Design and principle of an asynchronous motor operation. Why and when two types of rotor designs are used for asynchronous machines?

23. The principle of an asynchronous machine operation in generator mode. Where are asynchronous generators used?

24. Design and principle of an asynchronous motor operation. Modes of possible asynchronous machines operation.

25. Problems of starting asynchronous motors. How to improve the asynchronous motors starting characteristics?

26. The asynchronous motors mechanical characteristics. Problems of starting asynchronous motors.

27. Design, areas of application and principle of operation of an asynchronous motor.

28. An asynchronous motor speed control.

29. Advantages and disadvantages of asynchronous motors. Overload capacity of asynchronous motors.

30. Reverse, speed control and braking of an asynchronous motor.

31. Methods of starting asynchronous motors taking into account the rotor design.

32. The asynchronous motors principle of operation, reverse and speed control.

33. Problems and means of starting single-phase asynchronous motors.

34. Why asynchronous motors are the main consumers of reactive energy?

35. The principle of reversibility of electric machines. (Explain the example of the pumped storage power plant).

36. Design and principle of operation of a synchronous generator.

37. The reaction of the anchor in synchronous machines. Influence of the nature of the load on the response of the synchronous generator anchor.

38. Asynchronous start of the synchronous motor.

39. Methods of synchronous generators excitation.

40. Blondel's method of two reactions in the theory of synchronous machines.

41. Angular characteristics of synchronous generators (taking into account the design of the rotor).

42. Conditions for inclusion of synchronous generators for parallel operation. How to determine that the conditions are met?

43. Accurate and rough synchronization (self-synchronization) of a synchronous generator with a network.

44. Performance characteristics of a synchronous generator with the condition of the nature of the load.

45. *U*-shaped characteristics of synchronous generators. Explain the differences between under-excitation and over-excitation modes.

46. Fighting higher harmonics in synchronous generators.

47. Oscillations of the rotor of a synchronous generator.

48. Areas of use of synchronous motors. Angular characteristics of a synchronous machine with an explicit-pole rotor.

49. Problems and methods of starting synchronous motors.

50. Overload capacity of synchronous motors.

51. Purpose, design and characteristics of the synchronous compensator.

52. Purpose, design features, *U*-shaped characteristics of the synchronous compensator.

53. Advantages and disadvantages of DC machines. Areas of use of DC machines. Circuits of excitation windings of DC motors.

54. Design of DC machines. Name the main parts of the DC machine magnetic circuit.

55. The basic equation of DC motors. Speed controllers for DC motors.

56. Means of speed control of DC motors.

57. Purpose, design, maintenance of collectors in DC machines.

58. The principle of the electric machine's reversibility. Basic equations of generators and DC motors.

59. Schemes of inclusion of windings excitation of DC generators. Characteristics of DC machines with mixed excitation.

60. Schemes of inclusion of windings excitation of DC motors. Characteristics and areas use of DC machines with parallel excitation.

61. Schemes of inclusion of excitation windings the DC motor. Characteristics and scopes of DC motors use with independent excitation.

62. Characteristics and scopes of DC motors use with mixed excitation.

63. The reaction of the anchor in DC machines. Influence of anchor reaction on machine characteristics.

64. Means of combating the action of the anchor reaction.

65. Causes and evaluation of sparking on the collector. Spark suppressants.

66. Methods of starting, speed control and braking DC motors.

67. How to perform the reverse of DC motors, taking into account the circuit of the excitation winding.