

Power Engineering studies (course 2006)

Specialisation administrator: prof. Tadeusz Skoczkowski

Field of Study: Power Industry

Field of Specialization: Power Engineering

The Bachelor of Science degree final exam – problems and questions

A. General and fundamental subjects questions

1. Explain the meaning of the Second Law of Thermodynamics (entropy, reversible and non-reversible processes).
2. Numerical methods in engineering computations. Discuss types and sources of errors in numerical computations.
3. Discuss basic methods of temperature measurements and temperature sensors.
4. Discuss basic methods of gas pressure measurements and gauges used in the measurements.
5. Describe main causes of faults in mechanical machinery.
6. The First Law of Thermodynamics and its practical significance.
7. Basic conservation laws.
8. Simple and combined modes of heat transfer.
9. Laminar and turbulent flow. Velocity distribution of viscous fluid flow in a pipe.
10. Types of constraints in design process.
11. State equation of ideal gas.
12. Define concept of permissible stresses.

B. Power Engineering specialisation subjects questions

1. Biofuels and their role in energy market.
2. Discuss the concept of thermodynamic equilibrium.
3. Climate change process, causes and significance.
4. Combustions of fuels in fluidised bed.
5. Materials used in energy equipment construction. Discuss on examples.
6. Methods of CO₂ emission reduction (currently used and prospective).
7. Methods of controlling flows in pump systems.
8. Rankine cycle. Methods of improving energy efficiency of power stations.
9. Renewable energy sources. Potential and perspective of use.
10. Discuss energy conversion processes.
11. Thermal radiation - fundamental laws, heat transfer by radiation, examples.
12. Describe chosen energy system - national electric power grid, national gas system.
13. Combined cycle power units. Process structure, parameters and their impact on energy efficiency and power output.
14. Current and prospective energy technologies.

15. Explain the phenomenon of heat transfer between a wall and fluid.
16. Selection criteria of pumps in pumping systems.
17. Control systems of a power unit
18. Differences between control and regulation.
19. Modern power unit – designs , parameters of coal- and gas-fired units.
20. Emissions from a coal power station: types, values and reduction methods.
21. Design and operation of nuclear pressurised water reactor.
22. Modern development trends in nuclear power engineering.
23. Structure and operational rules of electricity market in Poland.
24. Selection of technology for an investment project in energy sector and its feasibility analysis.
25. Daily variations of electrical power demand and methods of its coverage.
26. Basic rules of radioactive protection, ionising radiation, its sources and characteristic parameters.
27. Nuclear energy and ways of its usage.
28. Classification of nuclear reactors according to neutron energy, application, materials, design.
29. ICT technology in energy sector - energy unit, power plants, electric energy system, power utility.
30. Heat storage in a power plant, CHP plant and gas-fired boiler plant. Purpose and
1. technologies used.
31. Explain the concept of effectiveness of heat pump.
32. Discuss the energy storage technologies.
33. Explain in what way solar energy equipment can be harmful for the environment.
34. What are the greatest resources of renewable energy on the Earth and why they cannot be fully utilised?
35. Discuss technologies of heat recovery from municipal waste.
36. What are the methods of solar energy conversion? Give examples.
37. What are the problems caused by energy generation from renewable sources?
38. What are the advantages and disadvantages of massive wind power usage?
39. What is the difference between combustion of biomass and fossil solid fuels?

The Master of Science degree final exam – problems and questions

1. Current and prospective energy technologies.
2. Describe either national electric power grid or national gas system.
3. Combined cycle power units. Process structure, parameters and their impact on energy efficiency and power output.
4. Thermal stresses and their importance in technology.
5. Differences between control and regulation.
6. Distributed control systems in power generation units.
7. ICT technology in energy sector - energy unit, power station, electric energy system, power utility.

8. Modern power generation unit - designs, parameters of coal- and gas-fired units.
9. Emissions from a coal-fired power station.
10. Structure and operational rules of electricity market in Poland.
11. Daily variations of electrical power demand and methods of its coverage.
12. Types of heat shields used for space craft protection during re-entry.
13. Nuclear energy - sources and possibilities of usage.
14. Classification of nuclear reactors according to neutron energy, application, materials, design.
15. Safety systems in nuclear power plants.
16. Nuclear fuel cycle.
17. Design and operation of nuclear pressurised water reactor.
18. Methods of reducing investment costs in nuclear energy sector.
19. Heat comfort and methods of its delivering.
20. Characterise two technologies of heat storage.
21. Discuss threats associated with massive usage of wind energy.
22. What are perspectives and limits of ocean energy usage?
23. What types of renewable energy sources can be used to cover base load?
24. In what way is the solar energy used without energy conversion?
25. Give advantages and disadvantages of massive solar energy usage.