

Electromechanical Generation & Maintenance (2015): Grades 9, 10, 11, 12, Higher Education

Adopted 2015

Explain the generation of electricity by traditional electromechanical methods EMGN.01

01. Explain basic electrical theory EMGN.01.01

- a. Describe atomic structure, the components of the atom and their charges EMGN.01.01.A
- b. Define electricity EMGN.01.01.B
- c. Compare and contrast DC and AC current EMGN.01.01.C
- d. Analyze voltage, current and resistance in a circuit EMGN.01.01.D
- e. Utilize Ohm's Law to calculate voltage, amperes and resistance. EMGN.01.01.E
- f. Measure voltage, amperes and resistance. EMGN.01.01.F

02. Analyze series and parallel circuits EMGN.01.02

- a. Distinguish series from parallel circuits. EMGN.01.02.A
- b. Describe the role and function of resistors (loads). EMGN.01.02.B
- c. Explain and apply circuit theorems (e.g., superposition, Thevenin's and Norton's theorems). EMGN.01.02.C
- d. Analyze the operation of components and electrical loads connected in a series and parallel circuit. EMGN.01.02.D
- e. Calculate voltage, amperes, resistance and power in a series and parallel circuit. EMGN.01.02.E
- f. Utilize mesh and node current analysis techniques. EMGN.01.02.F

03. Construct series and parallel electrical circuits EMGN.01.03

- a. Identify the source of AC and DC voltage. EMGN.01.03.A
- b. Trace the path of generated AC and DC voltage from its source to where it is used. EMGN.01.03.B
- c. Discuss the frequency of AC voltage. EMGN.01.03.C
- d. Explain the difference between peak voltage and RMS. EMGN.01.03.D
- e. Explore the effects of a capacitor and inductor in an AC circuit. EMGN.01.03.E

- f. Calculate the frequency and period of an AC sine wave. EMGN.01.03.F
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04. Examine transformers, and three-phase and single-phase voltage. EMGN.01.04

- a. Explain and diagram the operation of a transformer. EMGN.01.04.A
 - b. Contrast the difference between step-up and step-down transformers. EMGN.01.04.B
 - c. Explain how inductance is used in the operation of a transformer. EMGN.01.04.C
 - d. Distinguish between three-phase and single-phase voltage. EMGN.01.04.D
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05. Understand energy conversion processes and energy transmission systems used in the electromechanical power generation EMGN.01.05

- a. Interpret the theory of basic plant electrical components. EMGN.01.05.A
 - b. Identify the components that make up a power generation system EMGN.01.05.B
 - c. Identify the source of mechanical energy in fossil fuel plants. EMGN.01.05.C
 - d. Interpret the fundamentals of cycles (including vapor and combined power, co-generation, and Brayton and Rankin cycles) as they relate to energy resources used in the industry EMGN.01.05.D
 - e. Diagram how water and steam move through the steam cycle and explain how this movement is monitored and controlled EMGN.01.05.E
 - f. Diagram the water flow path through a typical drum boiler and explain how natural circulation makes this flow possible. EMGN.01.05.F
 - g. Define the terms drum boiler and natural circulation EMGN.01.05.G
 - h. Explain how steam is supplied to a turbine EMGN.01.05.H
 - i. Describe in general terms the operation of a boiler. EMGN.01.05.I
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06. Analyze nuclear energy as a principle of energy science. EMGN.01.06

- a. Explain the scientific process of producing nuclear energy. EMGN.01.06.A
- b. Describe the various applications for nuclear energy. EMGN.01.06.B
- c. Identify and describe the functions of the components in a nuclear facility. EMGN.01.06.C
- d. Explore and diagram the uranium mining and conversion process for producing nuclear fuel. EMGN.01.06.D
- e. Describe the reprocessing potential of spent nuclear fuel. EMGN.01.06.E
- f. Contrast critical fusion reactors to radioisotope thermoelectric generators. EMGN.01.06.F
- g. Discuss the capacity of nuclear energy to produce and deliver power for energy EMGN.01.06.G