Colorado CTE

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

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f. Calculate the frequency and period of an AC sine wave. EMGN.01.03.F

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

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

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