THERMODYNAMICS CENGEL 5TH EDITION SOLUTION MANUAL

Thermodynamics: An Engineering Approach, 5th Edition

Solution Manual

Question 1:

A rigid vessel contains 20 kg of water at 1 bar and 100°C. If the water is heated to 150°C, what is the pressure in the vessel?

Answer:

Using the steam tables, we find:

P1 = 1 bar, v1 = 0.1944 m3/kg P2 = ?, v2 = 0.3085 m3/kg (at 150°C)

Since the volume is constant, the mass remains the same. Therefore, the pressure can be calculated using the ideal gas law:

P2 = P1 *(v1 / v2) = 1 bar* (0.1944 m3/kg / 0.3085 m3/kg) = 0.630 bar

Question 2:

A piston-cylinder contains 0.5 kg of air at 150 kPa and 25°C. The air is compressed to 800 kPa while heat is transferred to keep the temperature constant. Determine the work done by the air.

Answer:

Using the ideal gas law, we find:

V1 = 0.658 m3/kg, P1 = 150 kPa P2 = 800 kPa, V2 = ? (unknown)

Since the temperature is constant, we have:

P1 *V1 = P2* V2

Solving for V2, we get:

V2 = P1 *V1 / P2 = 150 kPa* 0.658 m3/kg / 800 kPa = 0.127 m3/kg

The work done by the air is:

W = -?PdV = -?800 kPa *d(0.127 m3/kg) = -800 kPa* (0.127 m3/kg - 0.658 m3/kg) = 42 kJ/kg

Therefore, the total work done by the air is:

Wtot = m *W = 0.5 kg* 42 kJ/kg = 21 kJ

Question 3:

A heat pump operates on a Rankine cycle between 4°C and 90°C. The heat source for the heat pump is a solar collector, and the heat sink is the surrounding air. Determine the thermal efficiency of the heat pump.

Answer:

The thermal efficiency of a heat pump is given by:

? = Qh / Wh

where Qh is the heat absorbed from the heat source and Wh is the work done by the compressor.

From the Rankine cycle, we have:

Qh = Q2 + Q3 = h3 - h4 + h4 - h1 = h3 - h1 Wh = W12 + W23 = -h1 - h2 + h3 - h2 = h2 - h1

Therefore, the thermal efficiency becomes:

? = Qh / Wh = (h3 - h1) / (h2 - h1)

Using steam tables, we find:

h1 = 167.53 kJ/kg, h2 = 212.94 kJ/kg, h3 = 425.55 kJ/kg

Substituting these values, we get:

? = (425.55 kJ/kg - 167.53 kJ/kg) / (212.94 kJ/kg - 167.53 kJ/kg) = 40.6%

Question 4:

A Carnot engine operates between temperatures of 300 K and 600 K. What is the efficiency of this engine?

Answer:

The efficiency of a Carnot engine is given by:

? = 1 - Qc / Qh = 1 - Tc / Th

where Qc is the heat rejected to the cold reservoir and Qh is the heat absorbed from the hot reservoir.

Substituting the given temperatures, we get:

? = 1 - Tc / Th = 1 - 300 K / 600 K = 50%

Question 5:

A refrigerator operates on a reversed Carnot cycle between temperatures of 4°C and 30°C. The refrigerator consumes 200 W of electrical power. What is the rate of heat removal from the refrigerator?

Answer:

The rate of heat removal from a refrigerator is equal to the work done by the compressor, which is given by:

W = Qc / (1 - ?)

where Qc is the heat rejected to the cold reservoir and ? is the efficiency of the refrigerator.

The efficiency of a reversed Carnot cycle is given by:

? = 1 - Tc / Th

Substituting the given temperatures, we get:

? = 1 - 4°C / 30°C = 0.87

Therefore, the rate of heat removal from the refrigerator is:

W = Qc / (1 - ?) = 200 W / (1 - 0.87) = 1560 W

The Design of the Unix Operating System, Maurice J. Bach

Q1: Who designed the Unix operating system? A1: Maurice J. Bach, along with Ken Thompson and Dennis Ritchie, were the primary designers of the Unix operating system.

Q2: When was the Unix operating system first released? A2: The first version of Unix was released on December 3, 1971.

Q3: What were the key design principles of Unix? A3: Unix was designed with several key principles in mind: simplicity, modularity, portability, and extensibility.

Q4: How did the design of Unix influence the development of other operating systems? A4: Unix's design has had a profound influence on the development of subsequent operating systems, including Linux, macOS, and Android. Its features such as multitasking, pipes, and shells have become standard in modern operating systems.

Q5: What role did Maurice J. Bach play in the development of Unix? A5: Maurice J. Bach was a central figure in the early development of Unix. He worked on the operating system's internals, including the kernel, file system, and networking. Bach also wrote key documentation and manuals for Unix.

The Theory of the Firm: Microeconomics with Endogenous Entrepreneurs, Firms, Markets, and Organizations

Q: What is the theory of the firm? A: The theory of the firm is a microeconomic framework that seeks to explain how firms make decisions regarding production, pricing, and resource allocation in order to maximize profits.

Q: Why is the theory of the firm important? A: The theory of the firm provides insights into the behavior of firms, which are the building blocks of markets and economies. It helps us understand how firms operate, compete, and innovate, influencing market dynamics and economic growth.

Q: How does the theory of the firm account for endogenous entrepreneurs? A: Traditional theories often assume entrepreneurs are exogenous to the firm. However, endogenous entrepreneurship theory recognizes that entrepreneurship is an endogenous process within firms, driven by factors such as opportunities, incentives, and resources.

Q: What role do markets and organizations play in the theory of the firm? A: Markets provide firms with opportunities to buy inputs and sell outputs, while organizations define the incentives, structures, and processes that shape firm behavior. The theory of the firm examines the interplay between these elements and how they affect firm performance.

Q: How has the theory of the firm evolved over time? A: The theory of the firm has undergone significant evolution, encompassing new perspectives such as strategic management, behavioral economics, and organizational economics. These advancements have deepened our understanding of firm behavior, decision-making, and the impact of markets and organizations on firm performance.

Sure Thing Options Trading: A Money-Making Guide to the New Listed Stock and Commodity Options Markets Plume

Question: What is options trading?

Answer: Options trading involves buying or selling contracts that give the holder the right, but not the obligation, to buy or sell an underlying asset at a predetermined

price within a specific time frame.

Question: What is the new listed stock and commodity options market plume?

Answer: The new listed stock and commodity options market plume refers to the recent surge in popularity and trading volume of options contracts on exchanges. This growth has been fueled by increased investor interest in alternative investment strategies and the availability of advanced trading platforms.

Question: How can I make money with options trading?

Answer: Options trading can be a lucrative endeavor, but it requires a solid understanding of the markets and the different types of options strategies. Some common strategies include buying calls to bet on rising prices, buying puts to protect against losses, or selling options to generate income.

Question: What are the risks involved in options trading?

Answer: Options trading carries inherent risks, including the potential for losing the entire investment. It's essential to have a clear understanding of the risks involved and to use appropriate risk management techniques.

Question: Where can I learn more about options trading?

Answer: There are numerous resources available for learning about options trading, including books, online courses, and workshops. Additionally, many brokers offer free educational materials and training sessions designed to help investors navigate the options market. Remember, knowledge and experience are key to making informed trading decisions and maximizing the potential returns from options trading.

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