

VTU B.E/B.TECH QUESTION PAPER SET

CBCS SEMESTER V

FUNDAMENTAL OF THERMODYNAMICS

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15NT553

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Fundamental of Thermodynamics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Define thermodynamics, thermodynamic process and thermodynamic laws. (08 Marks)
 b. Explain Macroscopic and microscopic approaches in the study of thermodynamics. Give the practical applications of thermodynamics. (08 Marks)

OR

- 2 a. Discuss about the characteristics of system boundary and control surface with examples. (08 Marks)
 b. Distinguish between work and heat. (08 Marks)

Module-2

- 3 a. Write a brief note on energy. Prove that energy is a property of a system. (08 Marks)
 b. Brief about different modes of energy. (08 Marks)

OR

- 4 a. Write a brief note on the application of first law of thermodynamics to control volume or derive an expression for the first law of thermodynamics to control volume. (08 Marks)
 b. Write a brief note on applications of SS, and SFEE in Adiabatic throttling process and heat exchangers. (08 Marks)

Module-3

- 5 a. Discuss about direct heat engines and heat pump. Explain about working of a refrigerator and its COP. (08 Marks)
 b. State and explain Kelvin – Planck's second law of thermodynamics and perpetual motion machines. (08 Marks)

OR

- 6 a. Define and explain entropy. (08 Marks)
 b. Discuss about Clausius theorem and Clausius inequality. (08 Marks)

Module-4

- 7 a. Explain about pure substances, ideal gases and real gases. Give comparison between ideal gas law and real gas law. (08 Marks)
 b. Write a brief note on compressibility factor and compressibility chart of real gas. (08 Marks)

OR

- 8 a. Discuss about gravimetric and molar analysis of ideal gas mixtures. (08 Marks)
 b. Derive an expression of Dalton's law of additive pressure and Amagat's law of additive volume. (08 Marks)

Module-5

- 9 a. Explain the working principle, process and thermal efficiency of spark ignition – otto cycle with the help of P-V T-S diagrams. (08 Marks)
 b. Explain the working principle and process of a diesel engine cycle with the help of P-V and T-S diagram. (08 Marks)

OR

- 10 a. Explain briefly about Carnot vapour power cycle. (08 Marks)
 b. Discuss about the processes in a simple Rankine cycle. Add a note on the analysis and performance of Rankine cycle. (08 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

CBCS SCHEME

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15NT553

Fifth Semester B.E. Degree Examination, June/July 2018 Fundamentals of Thermodynamics

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing
ONE full question from each module.**

Module-1

- 1 a. Define thermodynamics, thermodynamic processes and thermodynamic laws. (08 Marks)
b. Discuss the characteristics of system boundary and control surface with examples. (08 Marks)

OR

- 2 a. Derive expressions for displacement work for different thermodynamic processes. (10 Marks)
b. Write a note on thermodynamic properties. (06 Marks)

Module-2

- 3 a. Briefly explain about the different modes of energy. (08 Marks)
b. Derive an expression for the first law of thermodynamics to control volume. (08 Marks)

OR

- 4 a. Derive an expression between heat and work. (06 Marks)
b. Write a brief note on energy. Prove that energy is a property of a system. (05 Marks)
c. What are pure substances? State and explain the two property rule for pure substance. (05 Marks)

Module-3

- 5 a. Discuss about direct heat engines and heat pump. Explain about working of a refrigerator and its COP. (08 Marks)
b. State and explain Kelvin-Planck's second law of thermodynamics and perpetual motion machines. (08 Marks)

OR

- 6 a. State and explain Clausius's second law of thermodynamics. Add a note on equivalence of Kelvin's-Planck's and Clausius's statements. (10 Marks)
b. Explain available and unavailable energy with a diagram. (06 Marks)

Module-4

- 7 a. Derive an expression for Dalton's law of additive pressures and Amagat's law of additive volume. (06 Marks)
b. Discuss about gravimetric and molar analysis of ideal gas mixtures. (10 Marks)

OR

- 8 a. Write a brief note on compressibility factor and compressibility chart of real gas. (08 Marks)
b. Write a short note on latent heat of steam. Explain about steam dryness fraction. (08 Marks)

Module-5

- 9 a. Explain the working principle, process and thermal efficiency of a spark ignition-otto cycle with the help of P-V and T-S diagrams. (08 Marks)
b. Explain briefly about Carnot vapour power cycle (08 Marks)

OR

- 10 a. Discuss about the processes in a simple Rankine cycle. Add a note on the analysis and performance of Rankine cycle. (08 Marks)
b. Write a detailed note on binary vapour cycle. (08 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any scribble or illegible answer will be treated as wrong answer.

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15NT553

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Fundamental of Thermodynamics

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain macroscopic and microscopic approaches in study of thermodynamics. Give the practical applications of thermodynamics. (08 Marks)
 b. Distinguish between work and heat. (08 Marks)

OR

- 2 a. Derive expressions for displacement work for different thermodynamic processes. (10 Marks)
 b. Explain about mechanical definition of work and thermodynamic definitions of work. (06 Marks)

Module-2

- 3 a. Write a brief note on energy. Prove that energy is a property of a system. (08 Marks)
 b. Explain Joules experiment and derive an expression between heat and work. What is mechanical equivalent of heat? (08 Marks)

OR

- 4 a. Brief about different modes of energy. (08 Marks)
 b. Derive an expression for the first law of thermodynamics to control volume. (08 Marks)

Module-3

- 5 a. Discuss about direct heat engines and heat pump. Explain about working of a refrigerator and its COP. (08 Marks)
 b. Describe about Clausius theorem and Clausius inequality. (08 Marks)

OR

- 6 a. State and explain Clausius's second law of thermodynamics. Add a note on equivalence of Kelvin-Planck's and Clausius's statements. (10 Marks)
 b. Explain about available and un-available energy. (06 Marks)

Module-4

- 7 a. Explain about pure substances, ideal gases and real gases. Give comparison between the ideal gas law and real gas law. (08 Marks)
 b. Write a brief note on compressibility factor and compressibility chart of real gas. (08 Marks)

OR

- 8 a. Discuss about gravimetric and molar analysis of ideal gas mixtures. (10 Marks)
 b. Derive an expression for Dalton's law of additive pressure and Amagat's law of additive volume. (06 Marks)

Module-5

- 9 a. Explain the working principle, process and thermal efficiency of a spark ignition otto cycle with the help of a P-V and T-S diagrams. (08 Marks)
 b. Write a detailed note on binary vapour cycle. (08 Marks)

OR

- 10 a. Explain the working principle, and process of a diesel engine cycle with the help of P-V and T-S diagrams. (08 Marks)
 b. Discuss about the processes in a simple Rankine cycle. Add a note on the analysis and performance of Rankine cycle. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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15NT553

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020

Fundamentals of Thermodynamics

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.***Module-1**

- 1 a. Define thermodynamics, thermodynamic processes and thermodynamic laws. (08 Marks)
b. Distinguish between work and heat. (08 Marks)

OR

- 2 a. Derive expressions for displacement work for different thermodynamic processes. (10 Marks)
b. Explain about mechanical definition of work and thermodynamic definition of work. (06 Marks)

Module-2

- 3 a. Write a brief note on energy. Prove that energy is a property of a system. (08 Marks)
b. Brief about different modes of energy. (08 Marks)

OR

- 4 a. Write a brief note on applications of SS and SFEE in adiabatic throttling process and heat exchangers. (08 Marks)
b. Derive an expression for the first law of thermodynamics to control volume. (08 Marks)

Module-3

- 5 a. State and explain Clausius's second law of thermodynamics. Add a note on equivalence of Kelvin-Planck's and Clausius's statements. (10 Marks)
b. Explain about available and unavailable energy. (06 Marks)

OR

- 6 a. Define and explain entropy. (08 Marks)
b. Discuss about clausius theorem and clausius inequality. (08 Marks)

Module-4

- 7 a. Discuss about gravimetric and molar analysis of ideal gas mixtures. (10 Marks)
b. Derive an expression for Dalton law of additive pressures and Amagat's law of additive volume. (06 Marks)

OR

- 8 a. Write a short note on latent heat of steam. Explain about steam dryness fraction. (08 Marks)
b. Write a note on Maxwell's equations, and heat capacity ratio. (08 Marks)

Module-5

- 9 a. Explain the working principle, process and thermal efficiency of a spark ignition-otto cycle with the help of P-V and T-S diagrams. (08 Marks)
b. Explain briefly about Carnot vapour power cycle. (08 Marks)

OR

- 10 a. Discuss about the processes in a simple Rankine cycle. Add a note on the analysis and performance of Rankine cycle. (08 Marks)
b. Write a detailed note on binary vapour cycle. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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17NT553

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020

Fundamentals of Thermodynamics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define thermodynamics, thermodynamic process, and thermodynamic laws. (10 Marks)
 b. Discuss about the characteristics of system boundary and control surfaces with examples. (10 Marks)

OR

- 2 a. Derive expression for displacement work for different thermodynamic process. (10 Marks)
 b. With a note on thermodynamic properties. (10 Marks)

Module-2

- 3 a. Derive an expression between heat and work, by explaining Joules experiments. (10 Marks)
 b. What is first law of thermodynamics? Derive a mathematical expression for cyclic and non cyclic process. (10 Marks)

OR

- 4 a. Write a brief note on energy, prove that energy is a property of a system. (10 Marks)
 b. Brief about different modes of energy. (10 Marks)

Module-3

- 5 a. Discuss about heat engines and heat pump. Explain about working of a refrigerator and in COP. (10 Marks)
 b. Describe about derive converting heat to work in a thermodynamic cycle with an example. (10 Marks)

OR

- 6 a. Discuss about Clausius theorem and Clausius inequality. (10 Marks)
 b. Discuss in detail about Carnots theorem, Carnot cycle and the process, assumption and importance. (10 Marks)

Module-4

- 7 a. Explain about pure substance, ideal gases, and real gases. Give comparison between the ideal gas law and real gas law. (10 Marks)
 b. Discuss about gravimetric and molar analysis of ideal gas mixture. (10 Marks)

OR

- 8 a. Derive an expression for Dalton's law of additive pressure and Amagat's law of additive volume. (10 Marks)
 b. With the help of T-V and P-V diagrams, explain the different phases of water add a note on critical point and triple point. (10 Marks)

Module-5

- 9 a. Explain the working principle, process and thermal efficiency of a spark – ignition- Otto cycle with the help of P-V and T-S diagrams. (10 Marks)
 b. Explain briefly about Carnot vapour power cycle. (10 Marks)

OR

- 10 a. Explain the working principle, and process of a diesel engine cycle with the help of P-V and T-S diagrams. (10 Marks)
 b. Write a detailed note on binary vapour cycle. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.