CONTENTS

A LIST OF IMPORTANT SYMBOLS	5
FOREWORD	7
INTRODUCTION	11
1. BASIC CONCEPTS AND DEFINITIONS USED IN THERMODYNAMICS	15
1.1. Energy	
1.2. Matter, substance, chemical element and atom	
1.3. Thermodynamic system	
1.4. Thermodynamic state, parameters and functions of the state	
1.5. Thermodynamic equilibrium	
1.6. Thermodynamic process	
Subjects and check questions	29
2. PHYSICAL QUANTITIES AND UNITS OF MEASURES USED IN TECHNIC	
THERMODYNAMICS	31
2.1. Systems and designations of measure units	
2.2. Physical quantities used in technical thermodynamics	
2.2.1. Energy, work and heat	40
2.2.2. Substance quantity	
2.2.3. Specific volume, density and specific weight	43
2.2.4. Pressure	
2.2.4.1. Absolute pressure and manometric pressure	
2.2.4.2. Static, dynamic and total pressure	
2.2.5. Temperature	
2.2.6. Power	
2.2.7. Stream of medium	
Subjects and check questions	53
3. LAW OF SUBSTANCE CONSERVATION	55
Subjects and check questions	59
4. ENERGY BALANCE	61
4.1. The Law of Energy Conservation	
4.2. The energy balance equation	62
4.3. Energy of thermodynamic system	
4.4. Internal energy	
4.4.1. Internal energy of solid and liquid bodies	
4.4.2. Internal energy of gases	73
4.5. Heat	
4.5.1. Specific heat of solid and liquid bodies	78
4.5.2. Specific heat of gases	79
4.6. Work	82
4.6.1. Absolute work	85
4.6.2. Useful work	8
4.6.3. Technical work	
4.6.4. Graph, internal and effective work	
4.7. Enthalpy - energy, delivered with substance stream	100

4.8. Energy efficiency	102
4.9. Equations of the first law of thermodynamics - special cases of ener	
balance	103
4.9.1. Equation of the first law of thermodynamics for closed-loop system	m103
4.9.2. Equation of the first law of thermodynamics for open system	105
Subjects and check questions	108
5. THE SECOND LAW OF THERMODYNAMICS	109
5.1. Reversibility and irreversibility of processes	
5.2. Statements of the second law of thermodynamics	
5.3. Entropy	
5.4. The law of entropy increase	116
5.5. Exergy	116
Subjects and check questions	
6. PROPERTIES OF GASES	121
6.1. Gas models	121
6.2. Laws of ideal gases	122
6.3. Mixtures of ideal and semi-ideal gases	
6.3.1. Fractions of components in mixture	128
6.3.2. Correlations among component fractions in a mixture	
6.3.3. Determination of alternative quantities for the mixture	131
6.3.4. The air as a mixture of gases	
6.4. Internal energy, enthalpy and entropy of gases, liquids and solid bodies	s135
6.4.1. Relationship among specific heats	
6.4.2. Internal energy	136
6.4.3. Enthalpy	
6.4.4. Entropy	138
Subjects and check questions	142
7. PROCESSES OF IDEAL AND SEMI-IDEAL GASES	143
7.1. Isobaric processes	
7.2. Isochoric processes	
7.3. Isothermal processes	
7.4. Adiabatic processes	
7.4.1. Reversible adiabatic - isentropic - processes	
7.4.2. Irreversible adiabatic processes	
7.5. Polytropic processes	
Subjects and check questions	
LITERATURE	173
TABLES OF THERMODYNAMIC PROPERTIES OF SOLIDS, LIQUIDS	
AND GASES	175