



Contents

<i>Preface</i>	vii
<i>Syllabus</i>	ix
Chapter 1: Ordinary Differential Equations of First Order	1–80
1.1 Introduction	1
1.2 Basic concepts	1
1.3 ODEs of first order and first degree	5
1.4 Exact equations	5
<i>Illustrative examples</i>	6
1.5 Integrating factors	10
<i>Illustrative examples</i>	11
1.6 Linear equation	25
<i>Illustrative examples</i>	26
1.7 Bernoulli's equation	35
<i>Illustrative examples</i>	36
1.8 ODE of first order and higher degree	45
<i>Illustrative examples</i>	45
<i>Illustrative examples</i>	50
<i>Illustrative examples</i>	68
<i>Multiple choice questions</i>	73
<i>Problems</i>	77
Chapter 2: Linear Differential Equations of Second Order	81–149
2.1 Introduction	81
2.2 Method for finding the complementary function (C.F.)	84
<i>Illustrative examples</i>	85
2.3 The operator D	87

2.4	Rules for finding particular integral (P.I.)	87
	<i>Illustrative examples</i>	89
2.5	Short methods for finding particular integrals (P.I.) in Some special cases	91
	<i>Miscellaneous examples</i>	102
2.6	Method of variation of parameters	112
	<i>Illustrative examples</i>	113
2.7	Cauchy-Euler equation	122
	<i>Illustrative examples</i>	123
2.8	Simultaneous linear differential equations	131
	<i>Illustrative examples</i>	132
	<i>Multiple choice questions</i>	142
	<i>Problems</i>	145
Chapter 3: Basics of Graph Theory	150–208	
3.1	Introduction	150
3.2	Graph and various related definitions	150
	<i>Illustrative examples</i>	153
3.3	Walks, paths, circuits, connected and disconnected graphs	158
3.4	Euler graph.....	162
3.5	Cut-sets and cut-vertices	164
3.6	Digraph (directed graph), weighted graph and bipartite graph	167
3.7	Matrix representation of graphs	174
	<i>Miscellaneous examples</i>	190
	<i>Multiple choice questions</i>	200
	<i>Problems</i>	204
Chapter 4: Tree	209–254	
4.1	Introduction	209
4.2	Trees and their properties	209
4.3	Binary tree	212
4.4	Spanning tree	213
4.5	Depth-First Search (DFS) and Breadth-First Search (BFS)	216
4.6	Minimal spanning tree	219
4.7	Shortest path.....	225
	<i>Miscellaneous examples</i>	229
	<i>Multiple choice questions</i>	245
	<i>Problems</i>	247
Chapter 5: Improper Integrals	255–297	
5.1	Introduction	255

5.2 Types of improper integrals	255
<i>Illustrative examples</i>	258
5.3 Test for convergence: Type I	262
<i>Illustrative examples</i>	263
5.4 Test for convergence: Type II	268
<i>Illustrative examples</i>	270
5.5 Beta and gamma functions	277
<i>Illustrative examples</i>	282
<i>Multiple choice questions</i>	292
<i>Problems</i>	295
Chapter 6: Laplace Transform	298–402
6.1 Introduction	298
6.2 Laplace transform	298
6.3 Laplace transforms of elementary functions	299
<i>Illustrative examples</i>	305
6.4 Laplace transform of $t^n f(t)$, where n is a positive integer	313
<i>Illustrative examples</i>	314
6.5 Laplace transform of $\frac{1}{t} f(t)$	317
<i>Illustrative examples</i>	318
6.6 Laplace transforms of derivatives	323
<i>Illustrative examples</i>	324
6.7 Laplace transforms of integrals	325
<i>Illustrative examples</i>	325
6.8 Laplace transforms of periodic functions	329
<i>Illustrative examples</i>	330
6.9 Laplace transform of unit step function	333
<i>Illustrative examples</i>	335
6.10 Table of Laplace transform theorems	338
6.11 Inverse Laplace transform	339
<i>Illustrative examples</i>	349
6.12 Solution of linear ordinary differential equation with constant coefficients (initial value problem) using Laplace transform	373
<i>Illustrative examples</i>	373
<i>Multiple choice questions</i>	390
<i>Problems</i>	396
Index	403