

CONTENTS

CONTENTS

PREFACE.....	i
 CHAPTER (1) : BASIC CONCEPTS OF NUMERICAL LINEAR ALGEBRA AND MATRIX COMPUTATION.....	1
1.1 : Terminology and definitions.....	1
1.2 : Matrix exponential function	11
1.2.1 : Theoretical and computational aspects for computing the matrix exponential e^A	13
1.2.2 : Explicit computation to the matrix exponential.....	17
1.3 : State transition matrix and the transient response vectors computation	19
1.3.1: Cayley-Hamilton method for computing the transient response vector	20
 CHAPTER (2): MATRIX EQUATIONS	25
2.1 : Introduction.....	25
2.2 : Linear matrix equations	28
2.3 : Nonlinear matrix equations	32
2.4: Smallest and largest positive definite solutions	34
 CHAPTER (3) : EXPLICIT FORMULAS FOR COMPUTING THE EXPONENTIAL OF SOME SPECIAL BLOCK MATRICES	37
3.0 : Introduction.....	37
3.1 : The exponential of general 2×2 matrix	37
3.2 : The exponential of block matrix	44
3.3 : Conclusion.....	48

CHAPTER (4) : A HYBIRD EFFICIENT AND ACCURATE METHOD FOR TRANSIENT RESPONSE COMPUTATION

4.1 : Introduction	49
4.2 : Preliminaries	50
4.3: Padé and restrictive Padé approximation for the exponential matrix ...	53
4.4 : Restrictive Padé approximation for the transient response computation	55
4.4.1 : The proposed algorithm	57
4.4.2 : Numerical results.....	58
4.4.3 : Highly accurate method for the transient response computation	60
4.5 : Remarks and conclusion.....	62

CHAPTER (5): ON THE EXISTENCE AND PROPERTIES OF THE POSITIVE DEFINITE SOLUTION OF THE MATRIX

$$\text{EQUATION } X = I + A^* \sqrt{X}^{-1} A$$

5.1 : Introduction.....	66
5.2 : Preliminaries	67
5.3 : The necessary and sufficient conditions for the existence of a positive definite solution	70
5.4 : Numerical examples	74
5.5 : Remarks and conclusion	76
REFERENCES	78
APPENDIX	80
ARABIC SUMMARY	