

Acknowledgments

Abstract Certificate

## 1. INTRODUCTION

- 1.1 Introduction to Composite Construction
- 1.2 Advantages of Composite Construction
- 1.3 Limit State Method for Composite Construction
- 1.4 GA as an Optimization Technique
- Scope and Objectives of the Present Work 1.5
- 1.6 Organization of the Thesis

## 2. GENETIC ALGORITHM – AN OVERVIEW

- 2.1. GA Terminology
- 2.2. Working of Genetic Algorithm
- 2.3. Coding of Design Variables
- 2.4. Fitness Evaluation and Fitness Scaling
- 2.5. Genetic Operators
- 2.6. Termination Criterion
- 2.7. Recommended Values of GA Parameters
- 2.8. GA Flow Chart for Solving a Problem

## 3. LITERATURE REVIEW

## 4. DEVELOPMENT OF PROGRAM FOR COMPOSITE SLABS

- 4.1 Introduction
- 4.2 The Composite Slab Elements
- 4.3 Analysis of Composite Slab
- 4.4 Resistance of Composite Slab to Bending
- 4.5 Shear Resistance of Composite Slab
- 4.6 Design of Composite Slab
- 4.7 Illustrative Example
- 4.8 Program for Composite Slabs

-	Dev	EL ODMENT OF DROCH AN FOR COMPOSITE DE AME	64-103
5.	<b>DEV</b> 5.1	ELOPMENT OF PROGRAM FOR COMPOSITE BEAMS An Overview	04-103
		Behavior of Simply Supported Composite Beam	
	5.2		
	5.3	Behavior of Continuous Composite Beam	
	5.4	Basis of the Design	
	5.5	Design of Composite Beams	
	5.6	Other Design Aspects	
	5.7	Illustrative Example	
	5.8	Program for Composite Beams	
6.	DEV	VELOPMENT OF PROGRAM FOR COMPOSITE COLUMNS	104-129
	6.1	Preamble	
	6.2	Calculation Methods	
	6.3	Local Buckling of Steel Elements	
	6.4	Force Transfer at Beam-Column Connections	
	6.5	Design Method	
	6.6	Illustrative Example	
	6.7	Program for Composite Columns	
7.	Sim	PLIFIED ANALYSIS AND DESIGN OF COMPOSITE FRAMES	130-138
	7.1	Introduction	
	7.2	Elastic Design Approach	
	7.3	Material Modelling	
	7.4	Sway and Non-sway Frames	
	7.5	Frame Analysis using ETABS Software	
	7.6	Frame Analysis using Moment Distribution Method	
	7.7	Frame Analysis using ANSYS Software	
8.	GA	BASED OPTIMIZATION OF COMPOSITE ELEMENTS	139-162
	8.1	General Remarks	
	8.2	Optimum Design Parameters for Composite Beam	
	8.3	GA Based Program Developed for Composite Beams	
	8.4	Design Example with Fixed Beam Spacing	
	8.5	Variable Beam Spacing without RCC Slab Example	
	8.6	Variable Beam Spacing with RCC Slab Example	

	9.1	General Remarks				
	9.2	Size Optimization Problem Formulation				
	9.3	Optimum Design Algorithm for Composite Frames				
	9.4	Design Example of a $1 \times 2$ Storey Composite Frame				
	9.5	Design Example of a $2 \times 3$ Storey Composite Frame				
	9.6	Design Example of a $2 \times 5$ Storey Composite Frame				
	9.7	A Parametric Study				
10	CAL	BASED OPTIMIZATION OF COMPOSITE TRUSSES				
10.						
	10.1	General Remarks				
	10.2	Truss Configurations in Common Use				
	10.3	Analysis and Design of Composite Truss				
	10.4	Configuration Optimization Problem Formulation				
	10.5	GA Implementation				
	10.6	Program Developed for the Composite Trusses				
	10.7	Optimum Design Example of a Warren Truss				
	10.8	Optimum Design Example of a Pratt Truss				
	10.9	Warren Truss Example with Vierendeel Panel				
	10.10	) Comparison of Results				
11.	11. FE MODELING OF SHEAR CONNECTION					
	11.1	Introduction to FEM				
	11.2	Description of Push-out Test				
	11.3	Design Strength of Shear Connectors				

Optimum Design Parameters for Composite Column

8.9 Composite Column Design Examples

9. GA BASED OPTIMUM DESIGN OF COMPOSITE FRAMES

GA Based Program Developed for Composite Columns

163-182

183-207

208-232

8.7

8.8

- 11.4 ANSYS as an Analysis Package
- 11.5 FE Modelling of Push-Out Test with Solid Slab
- 11.6 FE Modelling of Push-Out Test with Deck Slab

12. FE MODELING OF COMPOSITE BEAMS	233-244
12.1 Preamble	
12.2 Elements Selected	
12.3 Material Properties	
12.4 Failure Criterion	
12.5 Validation of Model- SS Beam Example	
12.6 Modeling of Continuous Beam	
13. PARAMETRIC STUDY OF A COMPOSITE STEEL-CONCRETE BUILDING	245-282
13.1 General Remarks	
13.2 Moment-Rotation Curves	
13.3 Types of Frames	
13.4 Linear Static Analysis	
13.5 Modelling of Buildings	
13.6 Parametric Study	
14. SEISMIC BEHAVIOUR OF A COMPOSITE BUILDING	
14.1 Structure's Important Dynamic Properties	
14.2 Procedures for Seismic Analysis	
14.3 Comparison of Seismic Analysis Methods	
14.4 Seismic Design Provisions for Composite Structures	
14.5 Design Example	
14.6 Structural Modelling in STAAD.Pro Environment	
14.7 Comparison of Results	
15. CONCLUSIONS AND FUTURE SCOPE	328-336
15.1 Summary	
15.2 Conclusions	
15.3 Future Scope	
REFERENCES	
APPENDIX - I LIST OF PAPERS PUBLISHED	