

List of Tables

Table No.	Name of Table	Page No.
2.1	Factors and levels in the experiment	13
2.2	Levels of the variable used in the experiment	15
2.3	Experimental factors and levels	19
2.4	Input parameters and their levels	28
2.5	Critical parameters and their levels	32
2.6	Factors and their levels	34
2.7	Independent variables and levels for model	36
2.8	Factors and levels used in experiments	39
2.9	Assignment of the factor levels	41
2.10	Process variables and their levels	42
2.11	Factors affecting on surface roughness and major investigators	44
2.12	Factors and levels for AISI 1040 steel and Aluminium	49
2.13	Factors and levels for AISI 410 steel and Aluminium	49
3.1	Some properties of some structural material – Average value	55
3.2	Comparison of structure materials	56
3.3	Recommended min. wall thickness for C.I. structures	61
3.4	Comparison of stiffness of different sections having equal c/s area	66
3.5	Effect of aperture and cover plate on stiffness of box type structures	68
3.6	Effect of end cover thickness on torsional and bending stiffness	69
3.7	Effect of stiffener on bending and torsional stiffness of box-type structures	71
3.8	Effect of external and internal vertical stiffeners	72
3.9	Effect of Combination of both horizontal and vertical stiffeners	73
3.10	Effects of External Vertical Bottom Stiffeners	75
3.11	Effect of stiffener arrangement on torsional stiffeners of open structures	77

4.1	FEA report and Result for Bed of turning operation	92
4.2	Deformation and stress (AISI 410 steel and $r = 0.8$ mm)	94
4.3	Deformation and stress (AISI 410 steel and $r = 0.4$ mm)	94
4.4	Deformation and stress (AISI 1040 steel and $r = 0.8$ mm)	94
4.5	Deformation and stress (AISI 1040 steel and $r = 0.4$ mm)	95
4.6	Deformation and stress (Aluminium and $r = 0.8$ mm)	95
4.7	Deformation and stress (Aluminium and $r = 0.4$ mm)	95
4.8	FEA report and Result for Head of turning operation	97
4.9	Deformation and stress (AISI 1040 steel and $r = 0.8$ mm)	99
4.10	Deformation and stress (AISI 1040 steel and $r = 0.4$ mm)	99
4.11	Deformation and stress (Mild steel and $r = 0.8$ mm)	100
4.12	Deformation and stress (Mild steel and $r = 0.4$ mm)	100
4.13	Deformation and stress (Aluminium and $r = 0.8$ mm)	100
4.14	Deformation and stress (Aluminium and $r = 0.4$ mm)	101
4.15	FEA report and Result for Saddle of turning operation	103
4.16	Deformation and stress (Mild Steel and $r = 0.8$ mm)	105
4.17	Deformation and stress (Mild Steel and $r = 0.4$ mm)	105
4.18	Deformation and stress (AISI 1040 steel and $r = 0.8$ mm)	106
4.19	Deformation and stress (AISI 1040 Steel and $r = 0.4$ mm)	106
4.20	Deformation and stress (Aluminium and $r = 0.8$ mm)	106
4.21	Deformation and stress (Aluminium and $r = 0.4$ mm)	107
5.1	Data for Multiple Linear Regressions	122
5.2	Analysis of variance for Significance of Regression in Multiple Regression	128
5.3	Specification Of Surface Roughness Tester	138
5.4	Factors and levels for AISI 1040 steel and Aluminium	141
5.5	Factors and levels for AISI 410 steel and Aluminium	141
5.6	Design of experiment and data for AISI 1040 steel and Aluminium	142

5.7	Design of experiment and data for AISI 410 steel and Aluminium	143
5.8	The prediction model with six variables (AISI 1040 steel and Aluminium)	144
5.9	The prediction model with six variables (AISI 410 steel and Aluminium)	144
5.10	Confirmation test (1040 steel and Aluminium)	148
5.11	Confirmation test (AISI 410 steel and Aluminium)	148
6.1	Parameters and their level (AISI 1040 Steel)	155
6.2	Specification of turning center	156
6.3	Mechanical properties of AISI 1040 steel	157
6.4	Result table (AISI 1040 Steel)	157
6.5	Estimated Regression Coefficients for Roughness	160
6.6	Analysis of Variance for Roughness (Linear) Ra	160
6.7	Estimated Regression Coefficients for Roughness (Quadratic) (Ra)	160
6.8	Analysis of Variance for Roughness (Quadratic) (Ra)	161
6.9	Confirmation test (AISI 1040 steel)	165
6.10	Response optimization for surface roughness parameters (1040 steel)	167
6.11	Parameters and their level (AISI 410 Steel)	167
6.12	Mechanical properties of AISI 410 steel	168
6.13	Result table (AISI410 steel)	168
6.14	Estimated Regression Coefficients for Roughness	170
6.15	Analysis of Variance for Roughness (Linear) (Ra)	171
6.16	Estimated Regression Coefficients for Roughness (Quadratic) (Ra)	171
6.17	Analysis of Variance for Roughness (Quadratic) (Ra)	172
6.18	Confirmation test (AISI 410 steel)	176
6.19	Response optimization for surface roughness parameters	177
6.20	Parameters and their levels (Mild steel)	178
6.21	Mechanical properties of Mild Steel	179
6.22	Result table (Mild Steel)	179

6.23	Estimated Regression Coefficients for Roughness	181
6.24	Analysis of Variance for Roughness (Linear) (Ra)	182
6.25	Estimated Regression Coefficients for Roughness (Quadratic)	182
6.26	Analysis of Variance for Roughness (Quadratic) (Ra)	183
6.27	Confirmation test (Mild steel)	187
6.28	Response optimization for surface roughness parameters	188
6.29	Parameters and their levels (Aluminium)	189
6.30	Mechanical properties of Aluminium	190
6.31	Experimental result (Aluminium)	190
6.32	Estimated Regression Coefficients for Ra)	192
6.33	Analysis of Variance for Roughness (Linear) (Ra)	192
6.34	Estimated Regression Coefficients for Roughness (Quadratic)	193
6.35	Analysis of Variance for Roughness (Quadratic) (Ra)	193
6.36	Confirmation test (Aluminium)	198
6.37	Response optimization for surface roughness parameters	199
7.1	Results of rigidity and stress analysis	201
7.2	Results of Modal analysis	201
7.3	Optimization of Head and Bed	202