

LIST OF FIGURES

Figure No.	Description	Page No.
Figure 1.1	Ply configuration $[[45^0/-45^0/90^0/0^0]_s]_s$ of 16 plies of the laminated composite	03
Figure 2.1	Configuration of the panel with T-shape stiffeners used by Bisagni and Vescovini [13]	10
Figure 2.2	Configuration of stiffened panel with I-shaped stiffeners used by Wang et al. [38]	14
Figure 2.3	The deformed shape of 1 st mode buckling by Wang et al. [38]	15
Figure 2.4	Configuration of stiffened panel with hat stiffeners used by Yang et al. [86]	21
Figure 2.5	Configuration of the panel with blade-shaped stiffeners used by Romano et al. [88]	22
Figure 2.6	Architecture diagram of 4-2-4-1 neural network by Alqedra and Ashour [93]	23
Figure 2.7	Plate made with plies and resin layer used by Chakraborty [103]	24
Figure 3.1	Displacement field and co-ordinate system	36
Figure 3.2	The hat-stiffened panel discretized with shell element (S4R)	39
Figure 3.3	The structural geometry of hat-stiffened panel	41
Figure 3.4	Cross-section of the hat-stiffener per pitch length with different elements	42
Figure 3.5	Global buckled mode shapes of 60 ⁰ -hat-stiffened panel	50
Figure 3.6	Global buckled mode shapes of 75 ⁰ -hat-stiffened panel	51
Figure 3.7	Buckling load of the 60 ⁰ -hat-stiffened panel with D_1/D_2 for different pitch length of stiffener and skin	53
Figure 3.8	Buckling load of the 75 ⁰ -hat-stiffened panel with D_1/D_2 for different pitch length of stiffener and skin	54

Figure 3.9	Buckling load/Area of the 60^0 -hat-stiffened panel with $(EA)_S/(EA)_P$ for different D_1/D_2 and skin	55
Figure 3.10	Buckling load/Area of the 75^0 -hat-stiffened panel with $(EA)_S/(EA)_P$ for different D_1/D_2 and skin	56
Figure 3.11	Optimum $(EA)_S/(EA)_P$ for different skin and D_1/D_2 for 60^0 -hat-stiffened panel	57
Figure 3.12	Optimum $(EA)_S/(EA)_P$ for different skin and D_1/D_2 for 75^0 -hat-stiffened panel	58
Figure 4.1	Structural geometry of the panel with 8 number of hat-stiffener	64
Figure 4.2	The stiffened panel discretized with shell element	65
Figure 4.3	Global buckled mode shapes of panel for (a) skin-1 with $D_1/D_2 = 200$, (b) skin-3 with $D_1/D_2 = 100$	66
Figure 4.4	Architecture diagram of a 4-7-2-1 multi-layer feedforward back-propagation neural network	69
Figure 4.5	The process of feed forward back-propagation in the neural network	71
Figure 4.6	Linear regression graph between target (FEA Result) and ANN prediction	74
Figure 4.7	Buckling load/Area of the 60^0 hat-stiffened panel vs. $(EA)_S/(EA)_P$	75
Figure 4.8	Buckling load/Area of the 75^0 hat-stiffened panel vs. $(EA)_S/(EA)_P$	76
Figure 4.9	Comparing FEA results with ANN predicted results vs. $(EA)_S/(EA)_P$ for 60^0 hat-stiffened panel with skin-2	77
Figure 4.10	Comparing FEA results with ANN predicted results vs. $(EA)_S/(EA)_P$ for 75^0 hat-stiffened panel with skin-1 and skin-3.	78
Figure 5.1	The structural geometry of the laminated composite 60^0 -hat stiffened panel	84
Figure 5.2	Cross section of the hat-stiffener per pitch length	85

Figure 5.3	Experimental set up of hydraulic machine with strain gauge data-logger system	86
Figure 5.4	Specimen of hat-stiffened panel installation	86
Figure 5.5	Locations of the strain gauges on panel	87
Figure 5.6	Failure mode of the panel	89
Figure 5.7	Load – axial displacement curves of experimental panel	90
Figure 5.8	Strain-load curves of strain gauge G1 and G2	91
Figure 5.9	Strain-load curves of strain gauge G3 and G4	92
Figure 5.10	Strain-load curves of strain gauge G5 and G6	93
Figure 5.11	Strain-load curves of strain gauge G13 and G14	94
Figure 5.12	The panel discretized with shell element for finite element analysis	96
Figure 5.13	Load–axial displacement curves of experimental and simulated panel	96
Figure 5.14	The out of plane displacement pattern at different load for FE analysis	98