College: Engineering **Student's Name:** Hawraa Sami Malik
Dept.: Civil **Supervisor's Name:** Dr. Ahmed Sagban Saadoon

Certificate: Master **Specialization:** Structure

Title:

Prediction of Flexural Behavior of Concrete Beams Reinforced With FRP Bars Using Artificial Neural Networks

Abstract:

Artificial neural networks (ANN) were used in this study to predict the flexural behavior of simply supported concrete beams reinforced with FRP bars under four point loading. Two case studies were considered in predicting the flexural behavior of these beams and the obtained results were compared with available experimental results and with the ACI 440.1R specifications. In the first case study, a proposed neural model (NN1) was developed to predict the ultimate load of concrete beams reinforced with FRP bars. A total number of (199) beams (samples) were collected as data set. It was found that the use of 11 and 10 nodes (neurons) in the first and second hidden layers, respectively, was very efficient for predicting the ultimate load. The proposed neural model gave very good predictions and more accurate results than the ACI 440.1R approach.

While in the second case study, a second proposed neural model (NN2) was developed to predict the ultimate load, deflection a t ultimate load, and load-deflection relationship of concrete beams reinforced with FRP bars. A total number of (68) beams were collected as data set. It was found that the use of 22 and 15 nodes in the first and second hidden layers, respectively, was very efficient and this model was very good and better than the ACI 440.1R approach. So it was concluded that, the proposed neural models in this study could be used efficiently in predicting the ultimate load, deflection at ultimate load, and/or load-deflection relationship of concrete beams reinforced with FRP bars.

Also a parametric study was performed, using the proposed neural model (NN2), to study the effect of variation of some parameters on the ultimate load, deflection at ultimate load, and load-deflection relationship of different concrete beams reinforced with FRP bars. This parametric study has been stated that the proposed neural model (NN2) predicts the ultimate load, deflection at ultimate load, and load-deflection relationship of these beams within the expected trend of such beams. And this is confirms the validity and accuracy of using the proposed neural model in predicting and studying the flexural behavior of concrete beams reinforced with FRP bars.