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Department	Mechanical Engineering
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Thesis Title	Stress Analysis in Thin Plate with Surface Crack Subjected to Cyclic Impact Loading
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Abstract	In this work, the stresses and dynamic crack growth were studied and analyzed in thin flat plate with a surface crack at the center, subjected to cycling low velocity impact loading for two types of aluminum plates (2024, 6061). Three main methods have been used in this study; first, analytical solution using classical plate theory by using Levy solution to determine stresses induced in plate due to the impact load. The impact load applied at the center of surface plate, was calculated by Hertzian contact law. The principal stresses with respect to time at the crack tip and the velocity of crack growth were calculated through elastic plastic fracture mechanics equations, because the impact loading will cause plastic zone around the crack tip and by Dugdal's model theory is found the size of this zone. Second, numerical analysis using program (ANSYS11-APDL) based on finite element method used to analyze and calculate the stresses and strains with respect to time at crack tip and then find the velocity of the crack growth under cyclic impact loading. In experimental work, rig system was designed and manufactured to apply the cycling impact loading on the cracked specimens. The grid which was screen in front of the crack tip to measure the elastic-plastic displacements in the x and y direction, in order to calculate the strains and stresses at the crack tip. These calculations have been made for different aspect ratio of plate (1:1& 1.3:1) with constant thickness (6mm), and different crack length (7, 10, and 12) mm with constant depth (2mm) and width (1.5mm). The all surface cracked plates were subjected to impact velocity (1.25m/s). Two cases of boundary conditions were used in this study; clamped-clamped with simply supported at the other edges, and clamped-clamped with free at the other edges. The values of crack depth to crack length (0.4, 0.57, 0.66) and crack depth to plate thickness (0.33) were taken for calculations