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PREDICTION OF OZONE CONCENTRATION AT SELECTED COASTAL SITES IN PENINSULAR MALAYSIA USING PROBABILITY DISTRIBUTION

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Thesis Submitted in Fulfillment of the Requirement for the Degree of Master of Science in the School of Fundamental Sciences Universiti Malaysia Terengganu

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Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

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School : School of Ocean Engineering

Generally, high ground-level ozone concentration can affect human health, agriculture and materials. The aim and objectives of this study is to determine the monsoonal variability of ozone concentration in selected sites (Kemaman, S1; Pulau Langkawi, S2; Kuala Terengganu, S3; Universiti Sains Malaysia, S4; Tanjong Malim, S5) accompanied with prediction via statistical distribution. Four different parent distributions such as gamma, Laplace, Rayleigh and log-logistic were applied in order to achieve second and third objectives. Matrix Laboratory version 2014 (MATLAB R2014a) was used to estimate the maximum likelihood estimation (MLE) and method of moment (MOM) distribution parameters; thus obtaining probability density function (PDF), cumulative distribution function (CDF) and performance indicator. Five selected performance indicator used in this study were mean biased error (MBE), normalized absolute error (NAE), prediction accuracy (PA), index of agreement (IA) and coefficient of determinant (R^2). The hourly ozone concentrations that exceed 100 ppb (Malaysia Ambient Air Quality Guideline, MAAQG) are considered exceedances event. The exceedance probability that exceeded MAAQG line in CDF plot was later used in achieving the third objective. Based on the outcomes for the first objective, high ozone concentrations were recorded during southwest monsoon in selected sites probably due

to high temperature and less rainfall. Other than that, the results based on performance indicator values show that S1, S2 and S4 fits the gamma distribution with MOM approach as the best model while S3 and S5 fits the Rayleigh distribution with MOM approach and gamma with MLE approach as the best distribution respectively. Pulau Pinang (S4) monitored exceedances in 2012 and 2013 while Tanjong Malim (S5) recorded exceedances from 2009 to 2013. In 2013, S4 and S5 were predicted to exceed MAAQG for 0.58 day and 2.05 days in 2014 with a return period of one occurrence per 629.3 days and per 178.3 days. In this ozone study, seasonal variability and prediction model via statistical distribution have been effectively determined.