MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Civil and Environmental Engineering
1.77 Water Quality Control

Problem Set 8 Spring 2006 Due April 25

Consider a well-mixed lake with no inflows or outflows located near Knoxville, TN (latitude about 36 ^{o}N) having a volume of $3x10^{6}$ m^{3} and a surface area of 20 ha. On March 1 the water temperature is 4 ^{o}C. a) Based on the following monthly meteorological data, compute the monthly variation in lake temperature T, equilibrium temperature T_e and surface heat loss coefficient K. b) Assuming waste heat is added at a rate of 2 MWt/ha, recompute the monthly (heated) lake temperature T_h.

Month	Ta (oC)	RH (%)	Wind speed (m/s)	Cloud Cover
Mar.	12.6	63	3.8	0.59
Apr	17.0	62	3.7	0.58
May	17.5	79	3.1	0.70
June	22.9	80	2.7	0.66
July	22.1	85	2.6	0.77
Aug.	22.9	80	2.3	0.70
Sept.	18.7	78	2.1	0.63
Oct.	14.6	74	2.5	0.50
Nov.	6.8	68	2.8	0.52
Dec.	7.0	80	3.0	0.77