King Abdulaziz University
Faculty of Engineering
Mechanical Engineering

MEP 460
Heat Exchanger Design
Spring 2022
HW. # 11 Answers (Bell & Delaware method

Using Bell-Delaware method

Input data

D_s [m]	d_i [mm]	d_o [mm]	L [m]	B_c [%]	L_{bc} [m]	N_{tt} [-]	θ_{tp} [°]	$R_{fi}^{"}$ [m^2.K/W]	$R_{fo}^{"}$ [m^2.K/W]
0.575	16	19	8	25	0.5	374	90	$1.76*10^{-4}$	$1.76*10^{-4}$

$\dot{m}_t$[kg/s]	$\dot{m}_s$[kg/s]	N_{tp} [-]	T_{si}[°]	T_{so} [°]	T_{ti} [°]	L_{tp} [mm]			
150	150	2	32	25	20	25.4			

Answers

S_m [m^2]	G_s [kg/m^2.s]	Re_s [-]	θ_{ds} [°]	θ_{ctl} [°]	θ_{otl} [°]	F_c [-]	J_c [-]	N_b [-]	N_c [-]
0.07379	677.6	15627	120	116.5	118.8	0.638	1.009	15	210

J_l [-]	R_l [-]	J_b [-]	R_b [-]	Jr [-]	J_s [-]	R_s [-]	j_i [-]	f_i [-]	$\varphi_s=(\mu/\mu_w)$
0.8447	0.604	0.8477	0.6637	1.0	1.0	2.0	0.00815	0.09317	0.9216

h_{id} [W/m^2.K]	J_{tot} [-]	h_s [W/m^2.K]	Δp_{bi} [Pa]	Δp_c [Pa]	Δp_w [Pa]	Δp_e [Pa]	Δp_s [Pa]	N_{tcw}	N_{tcc}
7411	0.7228	5150	946	5307	21681	3413	30401	4	11

Kern Approximate method

D_e [m]	A_s [m^2]	G_s [kg/m^2.s]	Re_s [-]	Nu [-]	h_s [W/m^2.K]	f [-]	Δp_s [Pa]	C=L_{tp}-d_o [mm]	
0.02423	0.07244	690.2	20303	149.1	3694	0.2702	26619	6.4	