

Answer 1

a) (5)

b) Enerji Denkliği:

$$(10) \rho C_p F_o T_o + \rho C_p F_1 T_1 - \rho C_p (F_o + F_1) T + 88 F_h (T_{ho} - T) = \rho C_p V \frac{dT}{dt} \quad (12)$$

* $Q = 88 F_h (T_{ho} - T)$ 'yi lineerleştirelim:

$$88 F_h T_{ho} - 88 F_h T$$

$$(88 \bar{F}_h \bar{T}_{ho} + 88 \bar{F}_h (T_{ho} - \bar{T}_{ho}) + 88 \bar{T}_{ho} (F_h - \bar{F}_h)) - (88 \bar{F}_h \bar{T} + 88 \bar{F}_h (T - \bar{T}) + 88 \bar{T} (F_h - \bar{F}_h)) \quad (2)$$

$$\rho C_p F_o T_o + \rho C_p F_1 T_1 - \rho C_p (F_o + F_1) T + [(88 \bar{F}_h \bar{T}_{ho} + 88 \bar{F}_h (T_{ho} - \bar{T}_{ho}) + 88 \bar{T}_{ho} (F_h - \bar{F}_h)) - (88 \bar{F}_h \bar{T} + 88 \bar{F}_h (T - \bar{T}) + 88 \bar{T} (F_h - \bar{F}_h))] = \rho C_p V \frac{dT}{dt}$$

Kararlı halden farklar cinsinden yazalım:

$$\rho C_p F_o \Delta T_o + \rho C_p F_1 \Delta T_1 - \rho C_p (F_o + F_1) \Delta T + 88 \bar{F}_h \Delta T_{ho} + 88 \bar{T}_{ho} \Delta F_h - 88 \bar{F}_h \Delta T - 88 \bar{T} \Delta F_h = \rho C_p V \frac{d\Delta T}{dt}$$

$$\rho C_p F_o \Delta T_o + \rho C_p F_1 \Delta T_1 + 88 \bar{F}_h \Delta T_{ho} + (88 \bar{T}_{ho} - 88 \bar{T}) \Delta F_h - (\rho C_p (F_o + F_1) + 88 \bar{F}_h) \Delta T = \rho C_p V \frac{d\Delta T}{dt} \quad (2)$$

$$\frac{\rho C_p F_o}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \Delta T_o + \frac{\rho C_p F_1}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \Delta T_1 + \frac{88 \bar{F}_h}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \Delta T_{ho} + \frac{88 \bar{T}_{ho} - 88 \bar{T}}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \Delta F_h - \Delta T = \frac{\rho C_p V}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \frac{d\Delta T}{dt}$$

$$+ \frac{88 \bar{T}_{ho} - 88 \bar{T}}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \Delta F_h - \Delta T = \frac{\rho C_p V}{\rho C_p (F_o + F_1) + 88 \bar{F}_h} \frac{d\Delta T}{dt}$$

$$D_1 \Delta T_0 + D_2 \Delta T_1 + D_3 \Delta T_{h_0} + A \Delta F_h - \Delta T = \tau_p \frac{d\Delta T}{dt}$$

$$D_1 T_0(s) + D_2 T_1(s) + D_3 T_{h_0}(s) + A F_h(s) - T(s) = \tau_p s T(s)$$

$$T(s) (\tau_p s + 1) = D_1 T_0(s) + D_2 T_1(s) + D_3 T_{h_0}(s) + A F_h(s)$$

$$T(s) = \frac{D_1}{\tau_p s + 1} T_0(s) + \frac{D_2}{\tau_p s + 1} T_1(s) + \frac{D_3}{\tau_p s + 1} T_{h_0}(s) + \frac{A}{\tau_p s + 1} F_h(s)$$

\bar{F}_h 'i Bulalım.

Kararlı halde:

$$\rho C_p F_0 \bar{T}_0 + \rho C_p F_1 \bar{T}_1 + 88 \bar{F}_h (\bar{T}_{h_0} - \bar{T}) - \rho C_p (F_0 + F_1) \bar{T} = 0$$

$$\rho = 880 \text{ kg/m}^3$$

$$C_p = 1.2 \text{ kcal/kg}^\circ\text{C}$$

$$F_0 = 2 \text{ m}^3/\text{h}$$

$$F_1 = 3 \text{ m}^3/\text{h}$$

$$\bar{T}_0 = 20^\circ\text{C}$$

$$\bar{T}_1 = 25^\circ\text{C}$$

$$\bar{T}_{h_0} = 80^\circ\text{C}$$

$$\bar{T} = 35^\circ\text{C}$$

$$\boxed{\bar{F}_h = 16 \text{ m}^3/\text{h}} \quad (2)$$

$$D_1 = 0.316$$

$$D_2 = 0.474$$

$$D_3 = 0.211$$

$$A = 0.592$$

$$\tau_p = 1.579$$

$$T(s) = \frac{0.316}{1.579s+1} T_0(s) + \frac{0.474}{1.579s+1} T_1(s) + \frac{0.211}{1.579s+1} T_{h_0}(s) + \frac{0.592}{1.579s+1} F_h(s) \quad (2)$$

$G_p(s)$