(e) **Cyclic process:** $T_f = T_i \Rightarrow U_f = U_i \Rightarrow \Delta U = 0$

by Eq (1) $\boxed{\Delta Q = \Delta W}$

So, in cyclic process whole of the heat taken by the system is used by it in doing work.

**EXAMPLE:** An electric heater supplies heat to a system at a rate of 100W. System performs work at a rate of 75 joules per second. At what rate is the internal energy increasing?

$\frac{\Delta Q}{\Delta t} = 100W$ ; $\frac{\Delta W}{\Delta t} = 75\ J/s = 75W$

$\frac{\Delta U}{\Delta t} = ?$

Acc. to 1st Law $\Delta Q = \Delta U + \Delta W$

$$\frac{\Delta Q}{\Delta t} = \frac{\Delta U}{\Delta t} + \frac{\Delta W}{\Delta t}$$