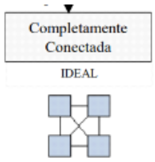
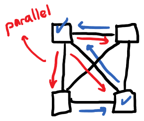
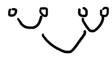
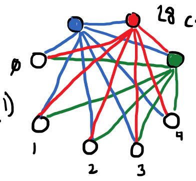
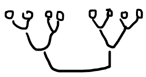
Sunday, March 20, 2022 8:27 PM

c.) Completely connected



Considering computation time complexity as:

$$t(np, n) = \left[\frac{n}{np} + 1\right] + kp = \left[\frac{n}{np} + 1\right] + \log_2 np$$

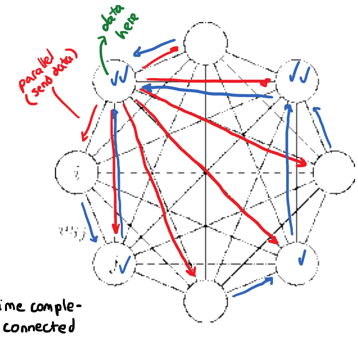
	Case	Data / Diagram	time	Tree (sums)
(serial)	$kp = 0 \quad 2^{kp} = 2^0 = 1$	P_1	$t = \emptyset$	$\emptyset$ [O
(parallel)	$kp = 1 \quad 2^{kp} = 2^1 = 2$	 1 conn $= \frac{2(1)}{2}$	send, 1 time: $t = 3 + \underbrace{3}_{1(3)\ \rightarrow kp(3)} = 6$	1] 
	$kp = 2 \quad 2^{kp} = 2^2 = 4$	parallel  6 conn $= \frac{4(3)}{2}$	send, 2, 1: $t = 3 + \underbrace{3 + 3}_{2(3)} = 9$, kp(3)	2] 
	$kp = 3 \quad 2^{kp} = 2^3 = 8$	 28 conn $= \frac{8(7)}{2}$	send, 4, 2, 1: $t = 3 + \underbrace{3 + 3 + 3}_{3(3)} = 12$, kp(3)	3] 

Gauss Sum:

$$7 + 6 + 5 + 4 + 3 + 2 + 1 \qquad \frac{n(n+1)}{2} \rightarrow \frac{(np-1)((np-1)+1)}{2} = \frac{(np-1)(np)}{2}$$

$$\frac{8(7)}{2} = 28$$

Connections $= \frac{np(np-1)}{2}$



Therefore we can say that

$t_c = 3 + kp(3)$ with $kp = \log_2 np$

$t_c = 3 + (\log_2 np)(3)$

$t_c(np, n) = \boxed{t_c = 3(1 + \log_2 np)}$ for communication time complexity in a completely connected network.