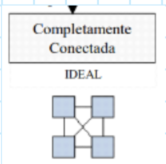
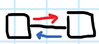
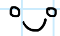
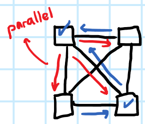
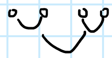
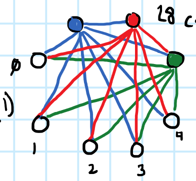
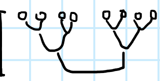
Sunday, March 20, 2022 8:27 PM

(c.) Completely connected



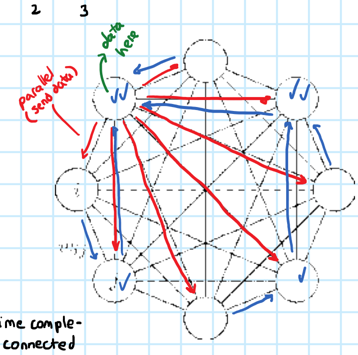
Case			Data/Diagram	time	Tree (sums)
(serial)	$kp=0$	$2^{kp}=2^0=1$	$\boxed{P_1}$	$t=\emptyset$	$\emptyset$
(parallel)	$kp=1$	$2^{kp}=2^1=2$	 1 conn $=\frac{2(1)}{2}$	$t = \overset{\text{send}}{3} + \underbrace{\overset{1\ \text{time}}{3}}_{1(3) \to kp(3)} = 6$	1 
	$kp=2$	$2^{kp}=2^2=4$	 6 conn $=\frac{4(3)}{2}$	$t = \overset{\text{send}}{3} + \underbrace{\underbrace{\overset{2}{3} + \overset{1}{3}}_{2(3)}}_{kp(3)} = 9$	2 
	$kp=3$	$2^{kp}=2^3=8$	 28 conn $=\frac{8(7)}{2}$	$t = \overset{\text{send}}{3} + \underbrace{\underbrace{\overset{4}{3} + \overset{2}{3} + \overset{1}{3}}_{3(3)}}_{kp(3)} = 12$	3 

$$7+6+5+4+3+2+1 = 28 \qquad \frac{8(7)}{2} = 28$$

Gauss Sum: $\frac{n(n+1)}{2} \rightsquigarrow \frac{(np-1)((np-1)+1)}{2}$

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

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



Therefore we can say that

$$t_c = 3 + kp(3) \quad \text{with } kp = \log_2 np$$

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

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