HW1

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4. (a) $\frac{6\text{Mbps}}{300\text{kbps}} = \frac{6\times10^6}{300\times10^3} = 20$

(b) Average number: $E(k) = 50\times0.2 = 10$

probability of k active users out of 50:

$$p(k) = C_{50}^{k}\cdot(0.2)^k\cdot(0.8)^{50-k}$$

Overload:

$$P(\text{overload}) = p(k>20) = \sum_{k=21}^{50} C_{50}^{k}\cdot(0.2)^k\cdot(0.8)^{50-k}$$

5. A —O—O— B

(1) $d_{prop} = 10ms$ $d_{trans} = \frac{L}{R}$, $R = 2\text{Mbps}$

#: $n = \frac{16\text{Mbits}}{5\text{ bits}} = \frac{16M}{5}$, $L = 5+160$ bits

$$T = g(5) = \frac{L}{R}\times n + d + \frac{L}{R} + d + \frac{L}{R} + d = \frac{L}{R}\times(n+2) + 3d$$

$$= \frac{L}{R}\times\left(\frac{16M}{5}+2\right) + 3\times\frac{L}{R}$$

$$\Rightarrow g(5) = \frac{5+160}{2M}\times\left(\frac{16M}{5}+2\right) + 3\times\frac{5+160}{2M}$$

$$= 8 + \frac{160\times8}{5} + \frac{5+160}{1M} + \frac{35+480}{2M}$$

$$= 8 + \frac{800}{2\times10^6} + \frac{1280}{5} + \frac{5\cdot5}{2\times10^6}$$