(4)

الف) circuit switching: $\frac{6 \times 10^3}{150} = 40$ users

ب) احتمال هر کاربر: 0/15

کاربر هزبان k: $\binom{200}{k} (0/15)^k (0/85)^{200-k}$

بیش از 30 کاربر به صد هزبان: $1 - \sum_{i=0}^{30} \binom{200}{i} (0/15)^i (0/85)^{200-i}$

(5)

packet size : 1050 bits

packet count : $\frac{190 \times 10^6 \times 2^3}{10^3} = 152 \times 10^4$ packets

11

PM

$d_{prop1} = \frac{10^3}{2 \times 10^8} = 5 \times 10^{-6}$ $\quad d_{prop2} = \frac{50 \times 10^3}{1,5 \times 10^8} = 3,3 \times 10^{-4}$

12

$d_{trans1} = \frac{152 \times 10^4 \times 10^5}{10^8} = 15,96$

13

$\frac{16 * MB}{152 \times 10^4} = 84,2 \text{ bits} \simeq 84$

$\frac{84}{1050} \times 100 = 8\%$ $\quad 100 Mb \times 8 = 800 Mb/s$

14

15

(7)

$d_{prop} = 10^{-4}\ s$

$d_{trans} = \frac{56000}{2 \times 10^{20}} = 2.8 \times 10^{-16}$

$\frac{56 \times 10^3}{64 \times 2^{10}} = 8.75 \times 2^{-8} \rightarrow d_{prod}$

$d_{total} = 8.75 \times 2^{-8} + 2.8 \times 2^{-16} + 10^{-4}$

16

17

ا)

$d_{prop\ xy} = 20ms$

$d_{prop\ yz} = 30ms$

$$50ms + \frac{3\times10^3\times2^3}{8\times10^6} + \frac{3\times10^3\times2^3}{3\times10^6}$$

ب)

$$\frac{3Mb}{3\times10^6} + \frac{90KB}{\frac{90\times10^3\times2^3}{8\times10^6}} + d_{prog} + 20\ ms = 485\ ms$$

$$8\times10^6 - (9\times10^4 + 3\times10^6) = 490\times10^4$$

$$\frac{49\times10^5}{8\times10^6} = 0.6125 \Longrightarrow 61.25\%$$

(14)

الف) 125 → زمان دسترسی لینک از مبدأ به مقصد

ب) $\frac{10}{2\times10^{8}} = 5\times10^{-6}\,s$ $\quad 3\times5\times10^{-6} = 15\times10^{-6}\,s \rightarrow d_{total}$

d_{total} 800 packets : $800 \times 15\times10^{-6}\,s = 12\times10^{-3}\,s$