1)

解:$P = 30 \times 10^6 bit$,

$R = 10 \times 10^6 bps$,

$v = 2 \times 10^8 m/s$,

$L = 10000km = 1 \times 10^7 m$,

$TRANSP = P/R = 3s$;

$PROP = L/v = 0.05s$;

$Latency = TRANSP + PROP = 3.05s$.

2)

解:$PROP \times R = 0.05 \times 1 \times 10^6 = 0.5Mbits$.

3)

解:$L_i = 5 \times 10^6 m$,

$TRANSP_i = 3s, i = 1,2$,

$PROP_i = L_i/v = 0.025s$,

$Latency = \sum_{i=1}^{2}(TRANSP_i + PROP_i) = 6.05s$.

4)

解:仅考虑单独一个packet:

$TRANSP_i = P/R = 10 \times 10^6 bit/10 \times 10^6 bps = 1s, i = 1,2$,

$PROP_i = L_i/v = 5 \times 10^6 m/2 \times 10^8 m/s = 0.025s, i = 1,2$,

考虑第一个packet:

$latency = \sum_{i=1}^{2}(TRANSP_i + PROP_i) = 2.05s$,

而总的延迟时间:

$Latency = latency + (3-1) \times TRANSP_i = 4.05s$.

5)

解:频分多路复用:10个通道,因此传输速率(transmission rate)应该变为原来的十分之一,那么

$R = 10 \times 10^6 bps$,

$TRANSP = P/R = 30s$;

$PROP = L/v = 0.05s$;

$Latency = TRANSP + PROP = 30.05s$.