# Tutorial: 04

**Solution: 1**

$$T_f = \frac{L}{R} = \frac{1000}{1 \times 10^6} = 1 \text{ m sec}$$

$$T_p = 270 \text{ m sec}$$

(a) $$U = \frac{1}{1+2A} \qquad A = \frac{T_p}{T_f} = \frac{270 \text{ m sec}}{1 \text{ m sec}} = 270$$

$$= \frac{1}{1+2\times 270} = 0.0018 \text{ or } 0.18\%$$

(b) $$U = \frac{7}{1+2A} = \frac{7}{1+2\times 270} = 0.0129 \text{ or } 1.29\%$$

(c) $$U = \frac{127}{1+2\times 270} = 0.2347 \text{ or } 23.47\%$$

(d) $$U = \frac{255}{1+2\times 270} = 0.4713 \text{ or } 47.13\%$$

**Solution: 2** Given probability of a single frame to be in error $p = 0.01 = P_f$

(a) Link Utilization $U = \frac{1 - P_f}{1 + 2A} = \frac{1 - 0.01}{1 + 2 \times 270}$

$= 0.00183$ or $0.183\%$

(b) $U = \frac{W(1 - P_f)}{1 + 2A} = \frac{7(1 - 0.01)}{1 + 2 \times 270} = 0.01281$ or $1.28\%$

(c) $U = \frac{127(1 - 0.01)}{1 + 2 \times 270} = 0.2324$ or $23.24\%$

(d) $U = \frac{255(1 - 0.01)}{1 + 2 \times 270} = 0.4666$ or $46.66\%$

**Solution: 3** Go to PPT 10. Lecture_performance analysis Slide No 3 and 8

**Solution: 4** Given $L = 1000$ bits in one packet

Total size of data $= 10^6$ bits

Number of packets $= \frac{10^6}{1000} = 10^3$

$T_p = \frac{5000 \times 10^3}{2 \times 10^8}$ sec $= 0.025$ sec

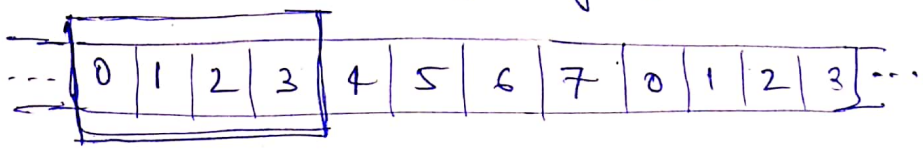
Time taken by one frame $= 2 \times T_p = 0.05$ sec

Time taken by 1000 frames $= 50$ sec Ans

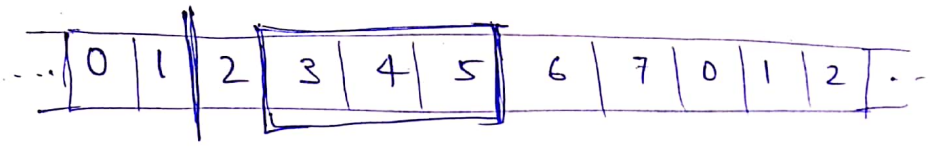
Solution: 5

Before sending any frames.

(a)




(b) After sending frames 0, 1, 2 and B acknowledge 0, 1 (Ack received by A)




(c) After A sends frame 3, 4 and 5 and B acknowledges 4 and the ACK is received by A