



**NPTEL ONLINE CERTIFICATION COURSES**

# **COMMUNICATIONS NETWORK**

**Dr. Goutam Das**

**G. S. Sanyal School of Telecommunications, IIT KHARAGPUR**

**Module 08: Media Access Control**

**Lecture 35: Aloha/ Slotted Aloha**

# Concepts Covered

Aloha – Hello Concept

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# References

Book:  
Queuing Systems Vol. 1 – L. Kleinrock

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**Module 08: Media Access Control**

**Lecture 36: Slotted Aloha**

# Concepts Covered

1-Aloha – Hello Concept

2-Descriptions of Slotted Aloha

# References

Book:  
Queuing Systems Vol. 1 – L. Kleinrock

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**Module 08: Media Access Control**

**Lecture 37: Slotted Aloha contd.**

# Concepts Covered

1-Aloha – Hello Concept

2-Descriptions of Slotted Aloha

# References

Book:  
Queuing Systems Vol. 1 – L. Kleinrock

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**Module 08: Media Access Control**

**Lecture 38: Slotted -Stability Analysis**

# Concepts Covered

1-Aloha – Hello Concept

2-Descriptions of Slotted Aloha

# References

Book:  
Queuing Systems Vol. 1 – L. Kleinrock

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**Module 08: Media Access Control**

**Lecture 39: Slotted -Stability Analysis contd.**

# Concepts Covered

1-Aloha – Hello Concept

2-Descriptions of Slotted Aloha

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$m$   
 $\Rightarrow \textcircled{n} \Rightarrow \text{BL}$   
 $m-n \Rightarrow \text{FA}$   
 $\Rightarrow$   
 $m=2$   
 $\Rightarrow$

Stability:

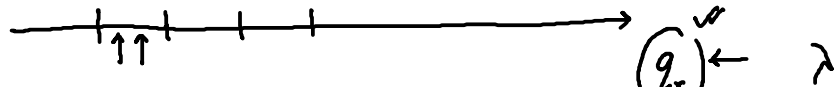
$\downarrow$   
 $\frac{m-n}{n}$  FA  
 $n$  BL

$(1-x)^y \approx e^{-xy}$   
 for small  $x$   
 $x \ll 1$

$\underline{q_a, q_r \ll 1}$

$\checkmark \underline{q_a < q_r}$

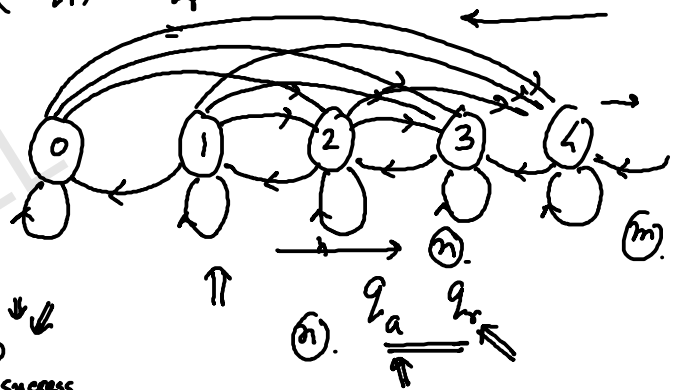
$m q_a$



$\checkmark Q_a(i, n) = \binom{m-n}{i} (1-q_a)^{m-n-i} q_a^i$

$\checkmark Q_r(i, n) = \binom{n}{i} (1-q_r)^{n-i} q_r^i$

$p_{n, n+i} = \{ \dots$



Drift

$\checkmark D_n = \frac{(m-n)q_a}{\uparrow} - \frac{p_{\text{success}}}{\downarrow}$

$\checkmark p_{\text{success}} = \underline{Q_a(1, n) Q_r(0, n)} + \underline{Q_a(0, n) Q_r(1, n)}$   
 $= \binom{m-n}{1} (1-q_a)^{m-n-1} q_a \binom{n}{0} (1-q_r)^n$   
 $+ \binom{m-n}{0} (1-q_a)^{m-n} \binom{n}{1} (1-q_r)^{n-1} q_r$

$\approx \frac{(m-n)q_a e^{-q_a(m-n-1)} e^{-q_r n}}{1} + \frac{n q_r e^{-q_a(m-n)} e^{-q_r(n-1)}}{1}$

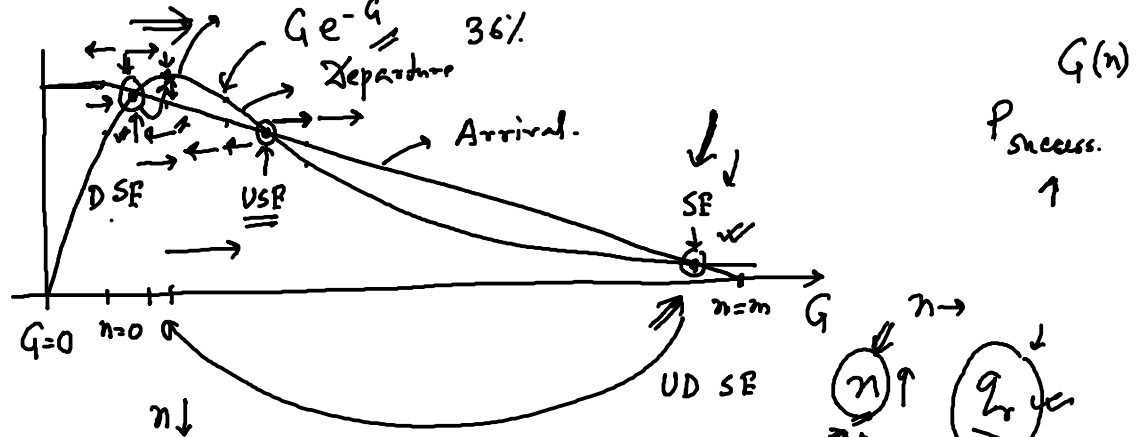
$\approx \left[ (m-n)q_a + n q_r \right] e^{-[(m-n)q_a + n q_r]} \approx X(n) e^{-X(n)}$

$G(n). X(n) = \underbrace{(m-n)q_a}_{\downarrow \text{FA}} + \underbrace{n q_r}_{\uparrow}$   
 $p_{\text{success}} = G(n) e^{-G(n)} \checkmark \underline{q_a e^{-q_a} \quad n=0}$   
 $\lambda + \Delta = G$   
 $X(n) = G(n)$   
 $G(n) e^{-G(n)}$

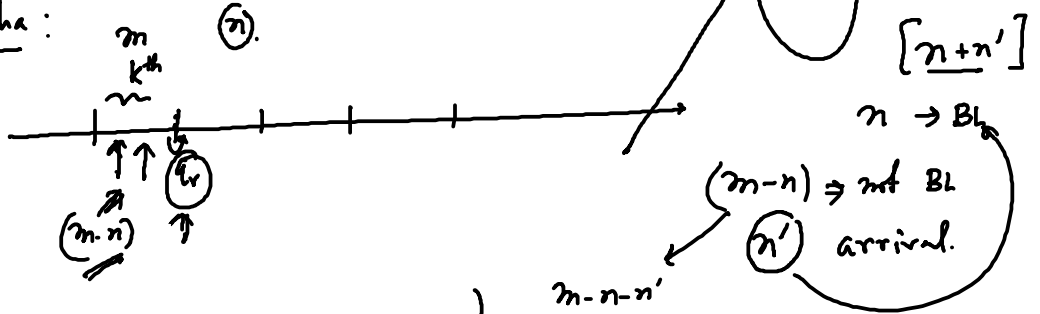
$$G(n) = m q_a + n(q_r - q_a)$$

$$(m-n) q_a$$

$$m q_a$$



Stabilized Slotted Aloha:



①.

