section 1 ⇒ (Samah)

Example 1 :-

effective area = 2.7 m
frequency = 20×10^9
$P_t = 30$ mw
$G_t = 30$ db

[a] what is gain of The receiver?

$$G_r = \frac{4\pi A_e}{\lambda^2}$$

$$\lambda = \frac{c}{f} = \frac{3 \times 10^8}{20 \times 10^9} = 0.015 \text{ m}$$

$$G_r = \frac{4\pi \times 2.7}{(0.015)^2} = 150796.4474 \text{ mw}$$

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$$G_r = 10 \log_{10}(150796.4474) = 51.783911 \text{ dB}$$

[B] what 's the Receiver power if The receiver is 5 km away From The transmitter?

$d = 5 \times 10^3$

$$P_r = \frac{P_t G_t A_e}{4\pi d^2}$$

$G_t = 30$ db $\Rightarrow 10^{(\frac{30}{10})}$ mw $=$ 1000 mw

$$*P_r = \frac{30 \times 1000 \times 2.7}{4\pi (5)^2} = 2.757 \times 10^{-4} \text{ mw}$$

$$= 10 \log_{10}(2.757 \times 10^{-4}) = -35.88 \text{ D}$$

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Example 2 :-

$P_t = 40\ W$ ↓ In free spac

(a) what's the Transmission power in unit of dBm?

$$P_t = 40 \times 10^3 = 4 \times 10^4 \text{ mw}$$

$$P_t = 10 \log_{10} (4 \times 10^4) = 46.020 \text{ DBM}$$

(B)

$$P_r = \frac{P_t G_t A_e}{4\pi d^2}$$

$d = 1000\ m$

$G_t = G_r = 0\ dB$

$G_t = G_r = 1\ mw$

$$A_e = \frac{G_r \lambda^2}{4\pi} \quad \Big| \quad \lambda = \frac{3 \times 10^8}{900 \times 10^6} = 1/3$$

$$\therefore P_r = \frac{P_t G_t G_r \lambda^2}{4^2 \pi^2 d^2} = \frac{4 \times 10^4 \times 1 \times 1 \times (1/3)^2}{4^2 \pi^2 (1000)^2}$$

$$= 2.81447 \times 10^{-5} \text{ mw}$$

$$= -45.51 \text{ DB}$$

Example 3:-

$$P_r = \frac{P_t G_t G_r \lambda^2}{4^2 \pi^2 d^2}$$

Received power = ?

$d = 60.000$ Km

$P_t = 4 \times 10^3$ mW

$G_t = 18$ dB

$G_r = 50$ dB

$P = 12 \times 10^9$

$$\lambda = \frac{3 \times 10^8}{12 \times 10^9} = 0.025$$

$$G_t = 10^{\left(\frac{18}{10}\right)} = 63.095,$$

$$G_r = 10^{\left(\frac{50}{10}\right)} = 100000,$$

$$P_r = \frac{(0.025)^2 \times 63.095 \times 100000 \times 4 \times 10^3}{4^2 \times \pi^2 \times (60.000 \times 10^3)^2} = 1.664 \times 10^{-3}$$

$$= 2.774 \times 10^{-11} \text{ mw}$$

$$P_r = -105.56 \text{ DB} \ldots\ldots$$

Example 4 :-

$F = 3 \times 10^9$

$d = 100m$

FspL $\leftarrow$ $L = \dfrac{(4\pi d)^2}{\lambda^2}$

$$\lambda = \frac{3 \times 10^8}{3 \times 10^9} = 0.1\,m$$

$$L = \frac{(4\pi \times (100))^2}{(0.1)^2} = 15791367 0.4\,\omega$$

$$= 81.98\ DB$$

Example 5:

$G_r = G_t = 1$ mw

$P = 4 \times 10^9$

$d = 35863 \times 10^3$ m

$$L = \frac{(4\pi d)^2}{\lambda^2}$$

$$\lambda = \frac{3 \times 10^8}{4 \times 10^9} = 0.075$$

$$L = 20 \underset{10}{\text{Log}} \left(\frac{4 \times \pi \times 35863 \times 10^3}{0.075} \right) DB = 195.575 \text{ DB}$$

ملخص القوانين :-

$$G_r = \frac{4\pi A_e}{\lambda^2}$$

$$P_r = \frac{P_t G_t A_e}{4\pi d^2} \qquad P_r = \frac{P_t G_r G_t \lambda^2}{4^2 \pi^2 d^2}$$

$$L = \frac{(4\pi d)^2}{(\lambda)^2}$$

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Lec (2) ...

Example (1)

$N = 200$ Bit

$B = 200 \times 10^3$

$V_t = 2 T_t$

$$T_t = \frac{N}{B}$$

$$T_t = \frac{200}{200 \times 10^3} = 10^{-3} \text{ sec.} \quad 1\text{ms}$$

$$V_t = 2\text{ms}$$

Example (2)

$N = 200$ Bit

$B = 200 \times 10^3$

$S = G \times e^{-2G}$ ← Throughput

↓ Frame متوسط ال

(a) 1000 Frame per second?

$G = 1000$ per second $= 1$ ms

$S = 1 \times e^{-1 \times 2} = 0.135$ (13.5٪)

← نسبة ال frame

في حالة 1000 me $= 13.5 \times 1000 = 135$ Frame

B) 500 frame per second?

$G = 0.5$ ms

$S = 0.5 \times e^{-0.5 \times 2} = 0.1839$ (18٪)

في حالة 500 me $= 0,1839 \times 500 = 92$ frame.

Lec (2) ...

Example (1)

$V_t = 2T_t$

$N = 200$ Bit

$B = 200 \times 10^3$

$$T_t = \frac{N}{B}$$

$$T_t = \frac{200}{200 \times 10^3} = 10^{-3} \text{ sec.} \quad 1ms$$

$V_t = 2ms$

Example (2)

$N = 200$ Bit

$B = 200 \times 10^3$

$S = G \times e^{-2G}$

Throughput ← S

G ← Frame متوسط ال

(a) 1000 Frame per second?

$G = 1000$ per second $= 1$ ms

$S = 1 \times e^{-1 \times 2} = 0.135 \quad (13.5\%)$

Frame ← نسبة ال

Frame 1000 من حالة $= 13.5 \times 1000 = 135$ Frame

B) 500 frame per second?

$G = 0.5$ ms

$S = 0.5 \times e^{-0.5 \times 2} = 0.1839 \quad (18\%)$

Frame 500 من حالة $= 0,1839 \times 500 = 92$ frame.

(C) 250 Frame per second?

$G = 1/4$ ms

$S = 1/4 \; e^{-2 \times 1/4} = 0.15$ (@15%)

250 الطبيعي $= 0.15 \times 250 = 37.9$ Frame.

Example 4:

$B = 1 \times 10^9$

$S = 200000 \times 10^3$

$d = 1 \times 10^3$

$$T_p = \frac{d}{S} = \frac{10^3}{200000 \times 10^3} = 5 \times 10^{-6}$$

$$N = 2 \times 5 \times 10^{-6} \times 10^9 = 10^4$$

Exa

$d = 2 \times 10^3$

$B = 10^7$

Speed $= 2 \times 10^8$

$$T_p = \frac{2 \times 10^3}{\cancel{10^7} 2 \times 10^8} = 10^{-5} s$$

$$N = 2 \times 10^{-5} \times 10^7 = 2 \times 10^2$$

Example 6 :-

$B = \frac{56 \times 10^3}{1000} = 56$ frame per second

Pure Alloha :-

$G = 0.5$ $\quad S = 0.184$

per second 56 عدد الإطارات $= 0.184 \times 56 = 10$ frame

Slotted Alloha :-

$G = 1$ $\quad S = 0.368$

frame 56 عدد الإطارات $= 0.368 \times 56 = 20$ frame

ملخص القوانين

$$T_t = \frac{N}{B}$$

pure:	$V_t = 2T_t$	$S = G \times e^{-2G}$
Alloha:	$V_t = T_t$	$S = G \times e^{-G}$
$T_p = \frac{d}{S}$	$\Rightarrow N = 2 \times T_p \times B$	

Lec (4)

Example 1:-

$B_t = 12.5 \times 10^6$

$B_g = 10 \times 10^3$ Hz

$B_c = 30 \times 10^3$ Hz

$$N = \frac{B_t - 2B_g}{B_c}$$

$$N = \frac{12.5 \times 10^6 - 2 \times 10 \times 10^3}{30 \times 10^3}$$

Example 2:-

$B_t = 25 \times 10^6$

$B_c = 200 \times 10^3$

$B_g = 0$

8 speech channel

$$N = \frac{25 \times 10^6 - 2 \times 0}{\frac{200 \times 10^3}{8}}$$

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* Total Bandwidth = $\frac{\text{time } T_t}{T_p + T_t}$

$= 1/2$

$T_t = 1 \times 10^{-3}$

$T_p = 1 \times 10^{-3}$

$B = 4 \times 10^6$

Bandwidth → only one frame

$B_t = 1/2 \times 4 \times 10^6 = 2 \times 10^6$

$B_g = 0$

$B_c = 2 \times 10^3$

$$N = \frac{2 \times 10^6}{2 \times 10^3} = 1000 \text{ station}$$

Example 3:-

Example 4 :-

$$\eta = 1 - \frac{b_{ov}}{b_t}$$

η ← Frame effiecncy

total Bit = 6 + 8.25 + 26 + 2X58 $
= 156.25

Total Bit = 156.25 X 8 = 1250

Bit_over head = 6 + 8.25 + 26 = 40.25

Total_Bit over head = 322

$$\eta = 1 - \frac{322}{1250} = 0,74$$