UNIT-TV ANALYSIS OF DISCRETE TIME SIGNAL ANALYSIS Discrete time Fourier Transform :- [ Fourier Transform of Discrete sequence] Discrete time signals are analysed with the help of poriodic Signals. DTFT -> Both poriodic and Non periodic signals. Definition =-DTFT of the discrete time signal x(n) is given as  $x(w) = \sum_{n=0}^{\infty} x(n) e^{i w n} \rightarrow A nalysis equation$ Here w is the Frequency of discrete time signal The range of w From -TT to TT are equivalently (0,2TT) and w is continuous over this range. x (w) is also called as spectrum of discrete time signal. DTFT Inverse  $x(m) = \frac{1}{2\pi i} \int x(w) e^{jwn} dw \rightarrow synthesis equation$ Existence of DTFT :-DTFT of x(n) will converge if x(n) is absolutely Summable  $\sum_{n=-\infty} |x(n)| < \infty$ Properties of DTFT :-() portode city :-If  $x(0) \leftrightarrow x(w)$  then  $x(wt 2\pi k) = x(w)$  $X(w) = \sum_{N=-\infty}^{\infty} x(n) e^{jwn}$ 

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$$x (w+2\pi k) = \sum_{n=-\infty}^{\infty} x(0) e^{j(w+2\pi k)n}$$

$$= \sum_{n=-\infty}^{\infty} x(0) e^{jwn} e^{j2\pi kn}$$

$$= x(w) \cdot e^{-j2\pi kn}$$

$$x (w+2\pi k) = x(w)$$

$$x (w+2\pi k) = x(w)$$

$$x (w+2\pi k) = x(w)$$

$$x (w) \cdot e^{j(w)} = x(w)$$

$$x(w) \leftrightarrow x(w) , y(n) \leftrightarrow y(w)$$

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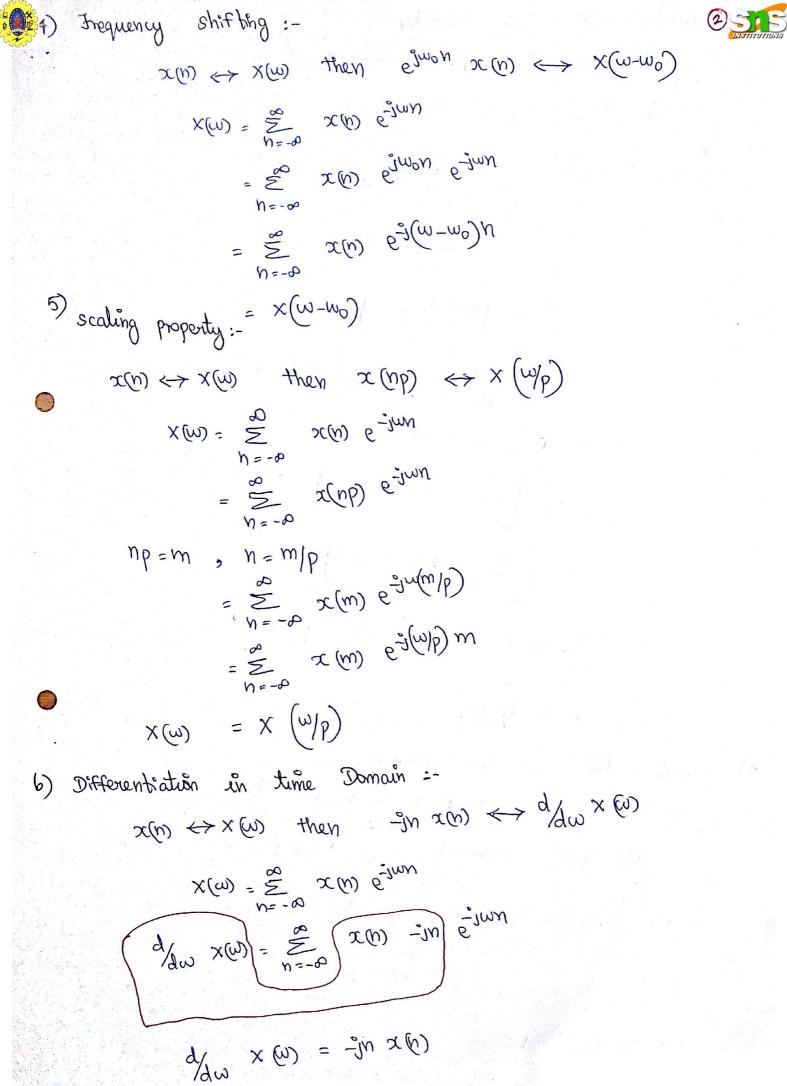
$$x(w) = \sum_{n=-\infty}^{\infty} x(0) e^{jwn}$$

$$= \sum_{n=-\infty}^{\infty} (ax(n) + by(n)] e^{-jwn}$$

$$= ax(w) + by(w)$$

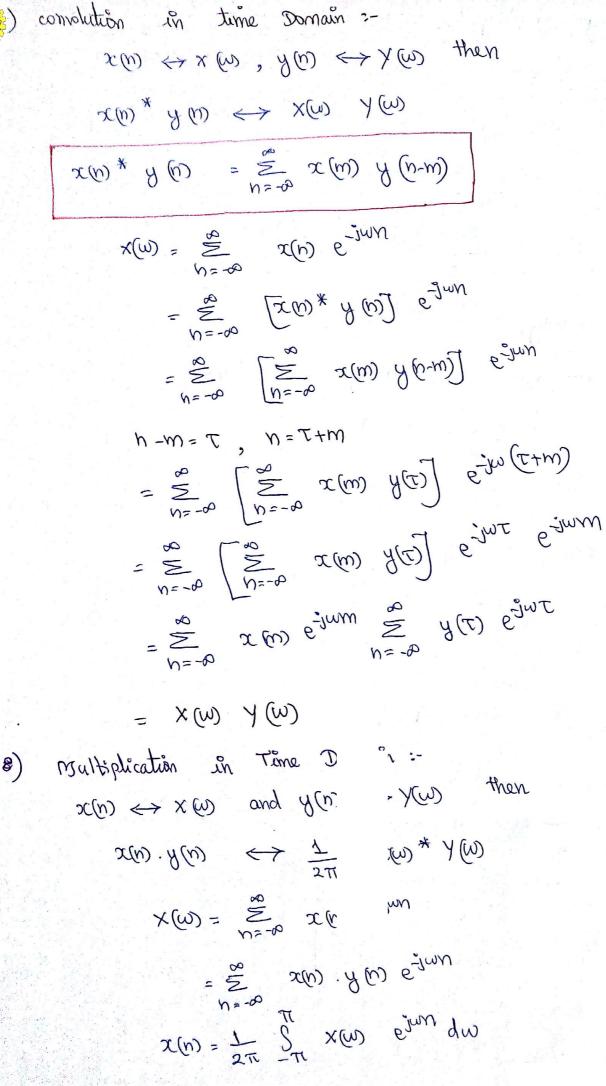
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$$= \sum_{n=-p}^{\infty} \frac{1}{2\pi n} \int_{-\pi}^{\pi} x(m) e^{3\omega m} dm \quad y(m) e^{3\omega m} dm$$

$$= \frac{1}{2\pi n} \sum_{n=-p}^{\infty} x(m) \int_{-\pi}^{\pi} y(m) e^{3(\omega - m)m} dm$$

$$= \frac{1}{2\pi} \int_{-\pi}^{\pi} x(m) \sum_{n=-\infty}^{\infty} y(m) e^{3(\omega - m)m} dm$$

$$= \frac{1}{2\pi} \int_{-\pi}^{\pi} x(m) y(\omega - m) dm$$

$$= \frac{1}{2\pi} (\sum_{n=-\pi}^{\pi} x(m) y(\omega - m) dm$$

$$= \sum_{n=-p}^{\pi} (x(m))^{2} dw$$

$$= \sum_{n=-p}^{\infty} x(m) (\sum_{n=-\pi}^{\pi} x(m) x^{*}(m) dm$$

$$= \sum_{n=-p}^{\infty} x(m) (\sum_{n=-\pi}^{\pi} x(m) x^{*}(m) dm$$

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