FAST FOURIER TRANSFORM

- Discrete Fourier Transform of a(m) of length M is given by:-

$$\text{??}-1$$

$$A(u) = \sum_{n=0}^{N-1} x(n) e^{-j 2\pi u n / N}, \quad 0 \le u \le N-1 \quad \textbf{(1)}$$

- Consider $W_M = e^{-j 2\pi / M}$ **(2)**

Raise both sides by M

$W_M^{\,M} = e^{-j 2\pi}$

$= \cos(2\pi) - i \sin(2\pi) = 1$

- Raise both sides by the power 1/M

$W_M = (1)^{1/M}$

- From equation (1) and (2) we get

$$A(u) = \sum_{n=0}^{N-1} a_n e^{-j\frac{2\pi}{N}un}, \quad 0 \le u \le N-1 \qquad \textbf{(3)}$$