



Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India
(Autonomous College Affiliated to University of Mumbai)

Mid Semester Examination
OCTOBER 2018

Max. Marks: 20

Class: M.Tech.

Duration: 60 Min

Semester: I

Date: 8 October 2018

Course Code: ET911

Branch: Electronics and Telecommunication

Name of the Course: Advanced Digital Signal Processing

Instruction:

- (1) All Questions are compulsory
- (2) Draw neat diagrams
- (3) Assume suitable data if necessary

Que 1. a)

Signal Modelling Techniques — 2M

Least Mean Square Technique → 2M
Modelling deterministic signal $x(n)$
as unit sample response of linear shift invariant
filter $h(n)$ $e'(n) = x(n) - h(n)$, $E\{e^j\omega\} = X(e^{j\omega}) - \frac{B(e^{j\omega})}{A(e^{j\omega})}$

Least Mean square applications — 2M

Que 1 b. Wiener Khitchine relation → 2M

Power spectral density → 2M

OR

Spectral factorization Theorem — 4M

$$P_x(z) = \sigma^2 G(z) G^*(1/z^*)$$

$P_x(z)$ power spectrum.

2(a). Decimator

(i) Single Stage: $\Delta f = \frac{f_{sc} - f_{pc}}{f_s} = \frac{5}{8 \text{ kHz}}$

~~$\phi = \frac{1}{2} = \frac{2}{4}$~~

$$M = \frac{-10 \log_{10} \delta_1 \delta_2 - 13}{14.6 \Delta f} + 1 = 5152$$

(ii) 2-stage Design:-
 $\alpha_1 = 25, \alpha_2 = 2, F_1 = 320 \text{ kHz}$

$\Delta f = \frac{165}{8000}, \delta_{11} = \frac{\delta_1}{2}, \delta_{21} = \delta_2$

Stage 1 δ
 f_{1k} $M_1 = 167$
 $F_2 = 160, \Delta f = \frac{5}{320}$

$M_2 = 220$

or.

Interpolator:-

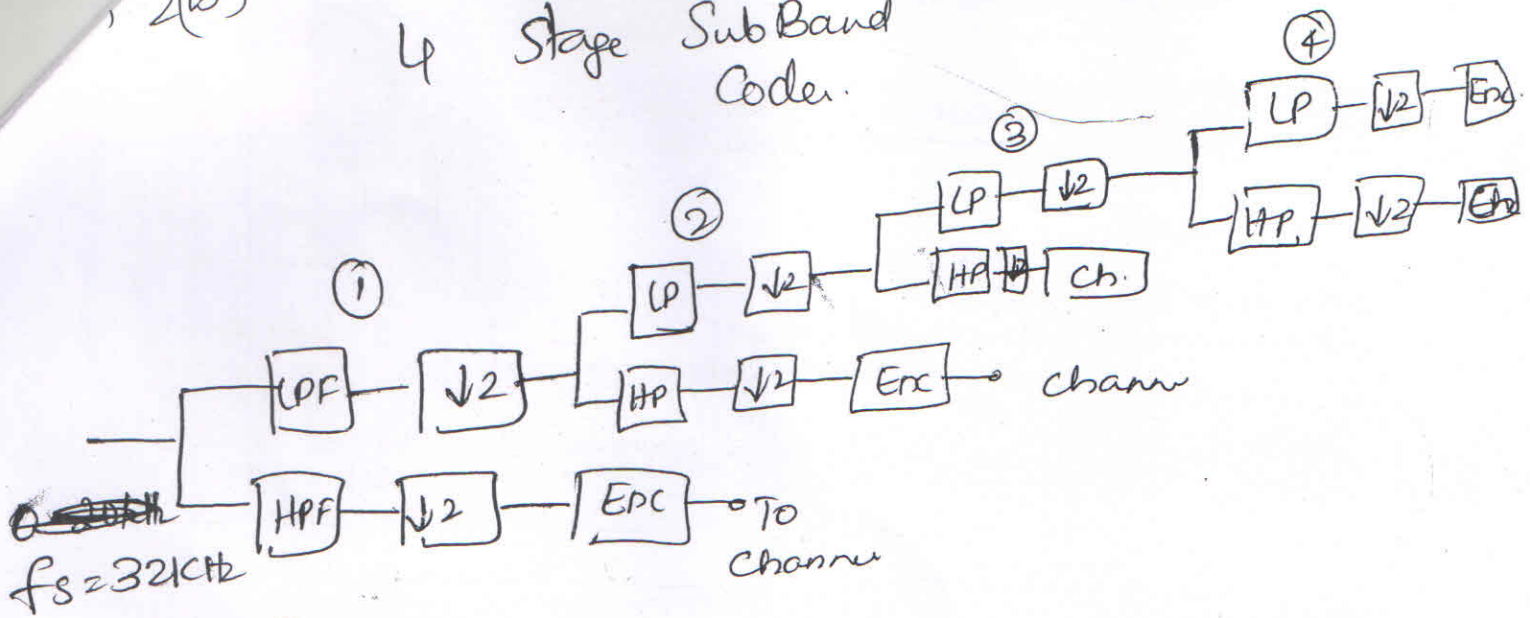
2 stage:-

$M_1 = 220$

$M_2 = 167$

2(b)

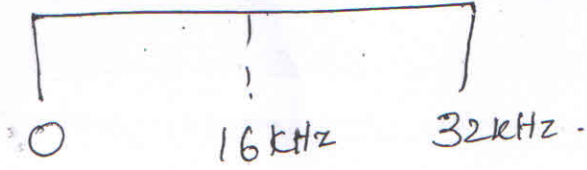
4 Stage SubBand Coder.



$f_s = 32\text{kHz}$

$f_s =$

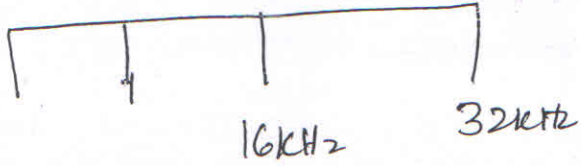
1st stage



$$0 < F < \frac{f_s}{4} \quad \&$$

$$\frac{f_s}{4} < F < \frac{f_s}{2}$$

2nd stage



3rd stage



4th stage

