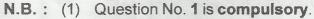
Con. 6624-10.

## (REVISED COURSE)

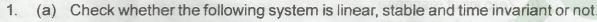
GT-7590

(3 Hours)

[ Total Marks : 100



- (2) Attempt any four questions out of remaining six questions.
- (3) Assume suitable data if required.



6

- (i)  $y(n) = ne^{x(n)}$
- (ii) y(n) = 4x(n+2) + 5
- (iii)  $y(n) = 8 \cos w_0 n x(n)$ .
- (b) State and prove convolution property of Z-transform.

5 5

(c) Explain Parseval's energy relationship.

3

Find the linear convolution of two sequences given by:-

$$x(n) = [1, 2, 3, 4]$$

$$h(n) = [4, 1, 2, 1]$$

2. (a) Obtain cascade and parallel realization for the following IIR filter:-

10

$$H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{(z - 0.25)(z^2 - z + 0.2)}$$

(b) A second order recursive system is described by :-

10

$$y(n) = \frac{1}{4}u(n-1) - \frac{1}{8}y(n-2) + x(n) - x(n-1)$$

- (i) Find the unit sample response
- (ii) Find the response to input  $x[n] = (y_2)^n u(n)$  with zero initial condition.
- 3. (a) Using DIF FFT, find DFT of following sequence;-

10

$$x(n) = \{1, 2, 3, 4, 1, 2, 3, 4\}$$

5

(b) Using results in Q.3 (a) Find  $X_2(k)$  if  $x_2(n) = x(n-2)$ .

5

(c) Using results in Q.3 (a), Find  $X_3$  (k) if  $x_3$ (n) =  $x^*$ (n).

- 10
- (a) Design a digital Butterworth low pass filter satisfying the following specifications 10 using bilinear transformation (Assume T = 1s)

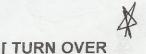
$$0 \cdot 9 \le \left| H\left(e^{jw}\right) \right| \le 1; \ 0 \le w \le \frac{\pi}{2}$$

$$\left| H\left(e^{jw}\right) \right| \le 0 \cdot 2; \ 3\frac{\pi}{4} \le w \le \pi$$

(b) Determine the filter co-efficients h(n) for the desired frequency response of a low pass filter.

$$H_d\left(e^{jw}\right) = \begin{cases} e^{-j2w}; -\frac{\pi}{4} \le w \le \frac{\pi}{4} \\ 0 \qquad ; \quad \frac{\pi}{4} \le w \le \pi \end{cases}$$

Using Hamming Window.



(a) The difference equation of the system is given by: 5.

12

$$y(n) = 3y(n-2) + 2y(n-1) + x(n)$$
  
and

$$x(n) = (1/2)^n$$
 u(n) with  $y(-1) = y(-2) = 1$ .

Determine:

- (i) Zero input response
- (ii) Zero state response
- (iii) Total response.
- Determine inverse Z-transform of  $x(z) = \frac{1}{1 \frac{3}{2}z^{-1} + 0.5z^{-2}}$  for all possible ROC.
- 6. (a) With the help of block diagram, explain TMS 320 (5x series of processors). 10
  - (b) Derive the radix-2 DIF-FFT for a 8-point DFT. 10
- Write short notes on any four :-7.
  - 20 (a) Applications of DSP in biomedical field
  - (b) Energy and Power Signals
  - (c) Filtering of long data sequences
  - (d) Relationship between Z-transform and Fourier transform
  - (e) Adaptive noise cancellation.