Reg. No. :

Question Paper Code : X 60450

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020

Fifth Semester

Electronics and Communication Engineering

EC 2302/EC 52– DIGITAL SIGNAL PROCESSING

(Regulations 2008)

(Common to PTEC 2302 Digital Signal Processing for B.E. (Part-Time) Electronics and Communication Engineering – Fourth Semester – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. State the advantages of FFT over DFTs.
2. What is meant by bit reversal ?
3. Mention the advantages of cascade realization.
4. Convert the given analog transfer function $H(s) = \frac{1}{s+a}$ into digital by impulse invariant method.
5. State the effect of having abrupt discontinuity in frequency response of FIR filters.
6. State Gibb's phenomenon.
7. What is scaling ?
8. What is dead band of a filter ?
9. Give the steps in multistage sampling rate converter design.
10. Write any four applications of multi-rate signal processing.

PART – B **(5×16=80 Marks)**

11. a) Explain in detail about overlap add method and overlap save method for filtering of long data sequences using DFT. **(16)**

(OR)

b) Develop a 8 point DITFFT algorithm. Draw the signal flow graph. Determine the DFT of the following sequence.

$x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$ using the signal flow graph. Show all the intermediate results on the signal flow graph. **(16)**

12. a) Discuss the steps in the design of IIR filter using Bilinear transformation for any one type of filter. **(16)**

(OR)

b) Convert the following pole-zero IIR filter into a lattice ladder structure. **(16)**

$$H(z) = \frac{\left[1 + 2z^{-1} + 2z^{-2} + z^{-3}\right]}{\left[1 + \left(\frac{13}{24}\right)z^{-1} + \left(\frac{5}{8}\right)z^{-2} + \left(\frac{1}{3}\right)z^{-3}\right]}$$

13. a) i) Determine the frequency response of FIR filter defined by $y(n) = 0.25\,x(n) + x(n-1) + 0.25x(n-2)$.

Calculate the phase delay and group delay. **(8)**

ii) Discuss the design procedure of FIR filter using frequency sampling method. **(8)**

(OR)

b) Design a FIR filter with the following desired specification.

$$H_d(e^{jw}) = \begin{cases} 0, & \frac{-\pi}{4} \le \omega \le \frac{\pi}{4} \\ e^{-j2\omega}, & \frac{\pi}{4} \le |\omega| \le \pi \end{cases}$$

Using a Hanning window with N = 5. **(16)**

14. a) Explain the quantization process and errors introduced due to quantization. **(16)**

(OR)

b) i) Explain how reduction of product round-off error is achieved in digital filters. **(8)**

ii) Explain the effects of coefficient quantization in FIR filters. **(8)**

15. a) Explain with block diagram the general poly phase frame work for decimator and interpolator. **(16)**

(OR)

b) Implement a two stage decimator for the following specifications :

Sampling rate of the input signal = 20,000 Hz

M = 100

Passband = 0 to 40 Hz

Transition band = 40 to 50 Hz

Passband ripple = 0.01.

Stopband ripple = 0.002. **(16)**