Reg. No. : | | | | | | | | | | | |

# A 1256

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Sixth Semester

Mechatronics Engineering

EE 351 — DIGITAL SIGNAL PROCESSING

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw basic block diagram of digital signal processing to process analog signals.

2. Briefly explain about a 3D signal and give an example for 3D signal.

3. Find transfer function of a system $Y(n) = a\,x(n) + b\,x(n-3) - c\,y(n-1)$.

4. State any two properties of 'Z' transform.

5. Draw the butterfly structure of 2 point DIF algorithm.

6. State and prove convolution property of discrete Fourier transform.

7. State sampling theorem.

8. Draw an A/D converter block diagram.

9. Differentiate IIR and FIR filters.

10. Find hamming window values for four point length ($h(n)$ for $N = 4$).

PART B — (5 × 16 = 80 marks)

11. (a) Discuss about sound recording application and Echo cancellation in telephone networks.

Or

(b) (i) Compare digital signal processing with analog signal processing. (6)

(ii) Briefly discuss about the classification of signals. (10)

12. (a) Find impulse response of a system if the input is {1, 2, 0,1} and output is {3, 2, 0, 2, 1}

Or

(b) (i) Find the power of the following signal $x(n)$ with period $N = 7$, where $x(n)$ is described over a period as

$$x(n) = \begin{cases} 4(-1)^n & n \geq 0 \\ 0 & n < 6 \end{cases} \quad (6)$$

(ii) Check whether the system is linear, static, casual, stable and time invariant $y(n) = c \cdot x(n^2)$. (10)

13. (a) Find DFT using FFT–DIT for {1, 1, 0, 1, 1, 0, 1, 1}

Or

(b) Derive and draw 8 point FFT-DIT using radix-2 algorithm.

14. (a) Explain briefly :

(i) Weighted register D/A convertor. (5)

(ii) Register – Ladder D/A convertor. (5)

(iii) Effect of sample and hold operation. (6)

Or

(b) Find the lowest order of a transfer function $H_a(s)$ having flat how pass characteristics with 1dB cutoff frequency at 1KHz and minimum attenuation of 40 dB at 5KHz. Find the transfer function of the filter.

15. (a) Realize the filter using Direct form-I and Direct form-II. (16)

$$\frac{(7z^{-2}+2z^{-1}+1)}{(3z^{-3}+2z^{-2}+3)}\ \frac{(1+4z^{-1})}{(1-5z^{-1})}$$

Or

(b) Design a linear phase FIR filter using hamming window for the following frequency response with filter length as 7.

$$H_d(w)=1 \quad \text{for } \pi/4 \le |w| \le \pi/4$$
$$=0 \quad \text{otherwise}$$

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