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

C 3337

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

Third Semester

Information Technology

IT 1201 — SIGNALS AND SYSTEMS

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Is the equation $y = ax + b$, where a and b are constants linear? Prove that.

2. How do you prove that the system is time invariant?

3. What is the Fourier transform of $x(t)e^{-jw_0 t}$ and $x(t - t_0)$ in terms of $X(jw)$?

4. What is the difference between Fourier transform of continuous signal and the Fourier transform of the discrete time signal?

5. Define Laplace transform. In what way it is different from Fourier transform?

6. What is the overall impulse response $h(t)$ when the two systems with impulse response $h_1(t) and\, h_2(t)$ are connected in parallel and in series?

7. What is meant by ROC of Z-transform?

8. What is the Z-transform of $a^n u(n)$ and $-a^n u(-n-1)$. In what way the Z-transforms of these two functions are different?

9. Find the transfer function of the system governed by the difference equation $y(n) - 2y(n-1) - 6y(n-2) = x(n) - 3x(n-1)$.

10. State shifting property and scaling property of the Z-transform.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw the waveform $e^{j\theta}$ for θ from 0 to 2π. (8)

(ii) Consider the signal $x_1(t)$ shown in figure 11. (a). Plot $x_1(t-1)+x_1(-t+2)$. (8)

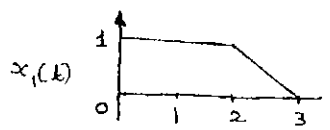

Fig. 11 (a)

Or

(b) (i) Express the signal in Figure 11.(b) in terms of step and ramp functions. (7)

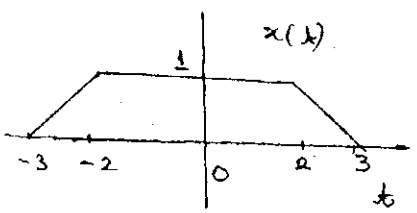

Fig. 11 (b)

(ii) Define periodic signal, odd signal and even signal with an example each. (9)

12. (a) Find the Fourier transform of delta function $\delta(t)$ and the unit step function $u(t)$ and plot the magnitude and phase plot.

Or

(b) (i) What is ROC of Laplace transform? State its properties. (4)

(ii) Derive the Laplace transform of $e^{-at}\sin\omega t$. (6)

(iii) State and prove the convolution theorem in time domain in Laplace transform. (6)

13. (a) The impulse response of the LTI system is $h(t)=u(t)$. Determine the output of the system if input $x(t)=e^{-at}u(t), a>0$. Use convolution in time domain.

Or

(b) Find the response of the R-C low pass system for the step input.

14. (a) (i) Find the Z-transform of $\left(\frac{1}{2}\right)^n u(n)+\left(\frac{1}{3}\right)^n u(n)$. (8)

(ii) Find the initial and final values of the function $x(z)=\left(1+z^{-1}\right)/\left(1-0.25z^{-2}\right)$. (8)

Or

(b) Determine the sequence $x(n)$ whose Z-transform is given as $x(z)=\frac{1+2z^{-1}+z^{-2}}{1-\frac{3}{2}z^{-1}+\frac{1}{2}z^{-2}}\ ROC\,|z|>1$.

15. (a) (i) Compute the linear convolution of the two sequences $x(n)=\{2,2,0,1,1\}$ and $h(n)=\{1,-2,-3,4\}$. (8)

(ii) Explain state-space model. (8)

Or

(b) (i) Determine the system function and impulse response $h(n)$ of the system $y(n)-\frac{1}{2}y(n-1)=2x(n)$ with initial condition. (8)

(ii) Obtain pole and Zeros of the system $y(n)=a\,y(n-1)+x(n)$. (8)