Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

R 3407

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Third Semester

Information Technology

IT 1201 — SIGNALS AND SYSTEMS

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the periodicity of $x(t) = e^{j100\pi t + 30°}$?

2. Draw the waveforms $\delta(t-2)$ and $u(t+2)$.

3. Define Fourier series and Fourier transform.

4. What is the difference between Fourier transform and Laplace transform?

5. What is meant by impulse response?

6. What are the basic steps involved in convolution integrals?

7. Define discrete time Fourier transform.

8. Define z-transform.

9. What is the z-transform of $u(n)$ and $\delta(n)$?

10. Draw the block diagram of state variable equation.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain real exponential and complex exponential signal. (8)

    (ii) Find the periodicity of the signal $x(n) = \sin \dfrac{2\pi n}{3} + \cos \dfrac{\pi n}{2}$. (8)

Or

(b) (i) Verify whether the system $y(n) = x^2(n)$ is linear and time invariant system. (8)

(ii) Decompose the signal $x(t)$ shown in Figure 11 (b) (ii) in terms of basic signals such as delta, step and ramp. (8)
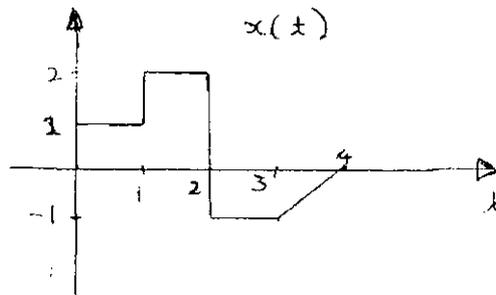

Figure 11 (b) (ii)

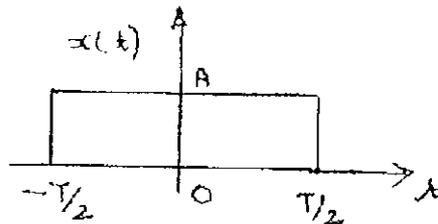12. (a) (i) Find the Fourier transform of the signal shown in Figure 12 (a) (i) (8)

Figure 12 (a) (i)

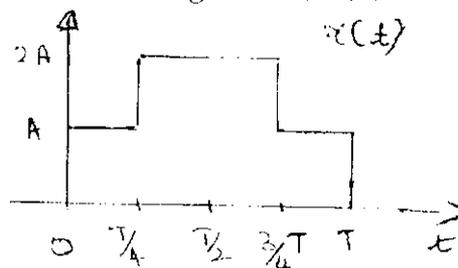(ii) Using Fourier transform properties find the Fourier transform of the signal shown in Figure 12 (a) (ii). (8)

Figure 12 (a) (ii)

Or

(b) (i) Find the Laplace transform of $x(t) = te^{-at}u(t)$. (8)

(ii) Find the inverse laplace transform of $X(s) = \dfrac{1}{(s+1)(s+2)}$. (8)

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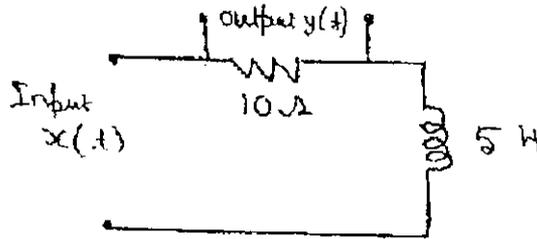13. (a) Find the unit step response of the circuit shown in Figure 13 (a). (16)

Figure 13 (a)

Or

(b) Consider an LTI system whose response to the input $x(t) = \left(e^{-t} + e^{-3t}\right) u(t)$ is $y(t) = \left(2e^{-t} - 2e^{-4t}\right) u(t)$. Find the system's impulse response. (16)

14. (a) (i) Find the z-transform of $x(n) = \left[\left(\frac{1}{2}\right)^{n} - \left(\frac{1}{4}\right)^{n}\right] u(n)$ and plot the pole-zero pattern. (6)

(ii) State and prove time shifting property and time-convolution property of z-transform. (10)

Or

(b) (i) What is the difference between Discrete Fourier transform and Discrete-time Fourier transform? (8)

(ii) Find the discrete Fourier transform of $x(n) = \{1, 1, 1, 1\}$. (8)

15. (a) Find the output of the system whose input-output is related by the difference equation :

$$y(n) - \frac{5}{6} y(n-1) + \frac{1}{6} y(n-2) = x(n) - \frac{1}{2} x(n-1) \text{ for the step input.} \quad (16)$$

Or

(b) Draw the state-space equation of a general discrete system with an example. (4 + 12)

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