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Question Paper Code : 51396

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Third Semester

Electronics and Communication Engineering

EC 2204/EC 35/EC 1202 A/080290015/10144 EC 305 – SIGNALS AND SYSTEMS

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Sketch the following signals

   (a) $x(t) = 2t$ for all t

   (b) $x(n) = 2n + 3$, for all n

2. Given $x[n] = \{1,-4,3,1,5,2\}$. Represent $x[n]$ in terms of weighted shifted impulse functions.

3. State the conditions for convergence of fourier series.

4. State any two properties of ROC of laplace transform $X(s)$ of a signal $x(t)$.

5. State the necessary and sufficient condition for an LTI continuous time system to be Causal.

6. Find the differential equation relating the input and output a CT system represented by $H(j\Omega) = \dfrac{4}{(j\Omega)^2 + 8j\Omega + 4}$.

7. What is an anti-aliasing filter?

8. State the multiplication property of DTFT.

9. Find the overall impulse response $h(n)$ when two systems $h_1(n)=u(n)$ and $h_2(n)=\delta(n)+2\delta(n-1)$ are in series.

10. Using Z-transform, check whether the following system is stable.

$$H(z)=\frac{z}{z-\frac{1}{2}}+\frac{2z}{z-3},\quad \frac{1}{2}<|z|<3.$$

PART B — (5 × 16 = 80 marks)

11. (a) (i) Given $x(t) = \frac{1}{6}(t+2), \quad -2 \le t \le 4$
$= 0 \quad$ otherwise

Sketch (1) $x(t)$ (2) $x(t+1)$ (3) $x(2t)$ (4) $x(t/2)$. (8)

(ii) Determine whether the discrete time sequence

$$x[n]=\sin\left(\frac{3\pi}{7}n+\frac{\pi}{4}\right)+\cos\frac{\pi}{3}n$$

is periodic or not. (8)

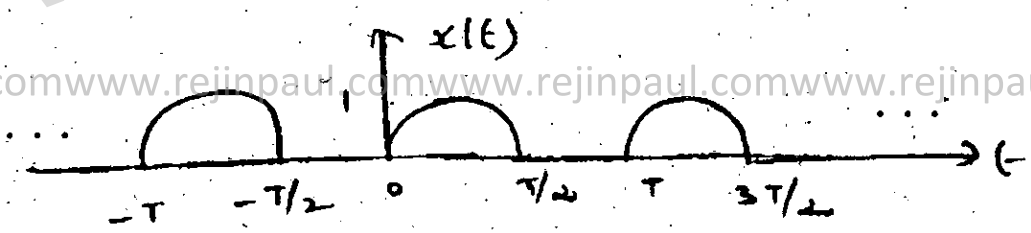
Or

(b) Check the following systems are linear, stable

(i) $y(t)=e^{x(t)}$ (8)

(ii) $y(n)=x(n-1)$. (8)

12. (a) Find the fourier series coefficients of the signal shown below :



Or

(b) Find the inverse laplace transform of $X(s)=\frac{1}{(s+5)(s-3)}$ for the ROCs

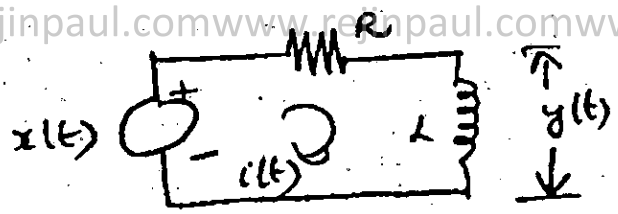
(i) $-5<\text{Re}\{s\}<3$. (8)

(ii) $\text{Re}\{s\}>3$ (8)

13. (a) Using convolution integral, determine the response of a CTLTI system $y(t)$ given input $x(t) = e^{-\alpha t}u(t)$ and impulse response $h(t) = e^{-\beta t}u(t)$, $|\alpha| < 1, |\beta| < 1$.

Or

(b) Find the frequency response of the system shown below :



14. (a) Using convolution property of DTFT, find the inverse DTFT of

$$X(e^{jw}) = \frac{1}{(1-\alpha e^{-jw})^2}, \quad |\alpha| < 1.$$

Or

(b) Find the inverse Z-transform of $X(z) = \frac{z^2}{(z-0.5)(z-1)^2}, |z| > 1$.

15. (a) Find the convolution of sum of $x[n] = r[n]$ and $h[n] = u[n]$. (16)

Or

(b) A casual LTI system is described by $y[n] - \frac{5}{6}y[n-1] + \frac{1}{6}y[n-2] = x[n]$ where $x[n]$ is the input to the system $h[n]$ is the impulse response of the system. Find

(i) System function $H(z)$

(ii) Impulse response $h(n)$.