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

Question Paper Code : 97060

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Third Semester

Electronics and Communication Engineering

EC 6303 — SIGNALS AND SYSTEMS

(Common to Biomedical Engineering and Medical Electronics Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State two properties of unit impulse function.

2. Draw the following signals :

   (a) $u(t)-u(t-10)$

   (b) $(1/2)^n u(n-1)$.

3. State the conditions for the convergence of Fourier series representation of continuous time periodic signals.

4. Find the ROC of the Laplace transform of $x(t)=u(t)$.

5. Draw the block diagram of the LTI system described by $\frac{dy(t)}{dt}+y(t)=0.1x(t)$.

6. Find $y(n)=x(n-1)*\delta(n+2)$.

7. Find the DTFT of $x(n)=\delta(n)+\delta(n-1)$.

8. State and prove the time folding property of z-transform.

9. Give the impulse response of a linear time invariant time as $h(n)=\sin \pi n$, check whether the system is stable or not.

10. In terms of ROC, state the condition for an LTI discrete time system to be causal and stable.

PART B — (5 × 16 = 80 marks)

11. (a) Check whether the following signals are periodic/aperiodic signals.

(i) $x(t) = \cos 2t + \sin t/5$.

(ii) $x(n) = 3 + \cos \pi/2n + \cos 2n$.

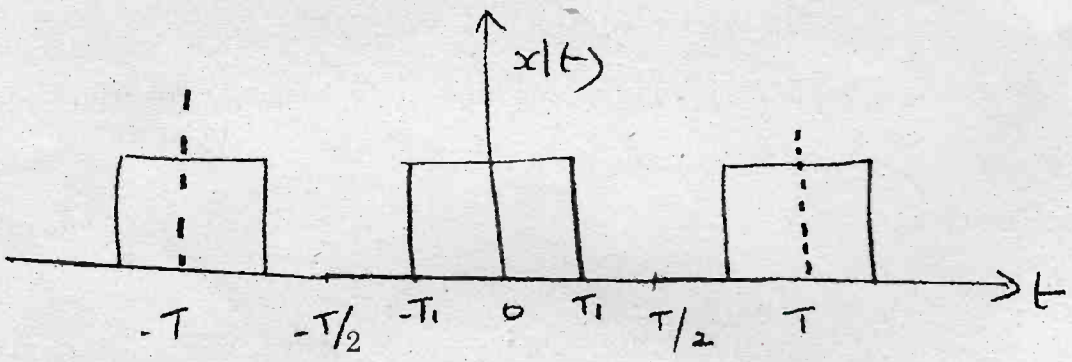
Or

(b) Check whether the following system is linear, causal time invariant and /or stable

(i) $y(n) = x(n) - x[n-1]$

(ii) $y(t) = \frac{d}{dt} x(t)$.

12. (a) Find the Fourier series coefficients of the following signal :

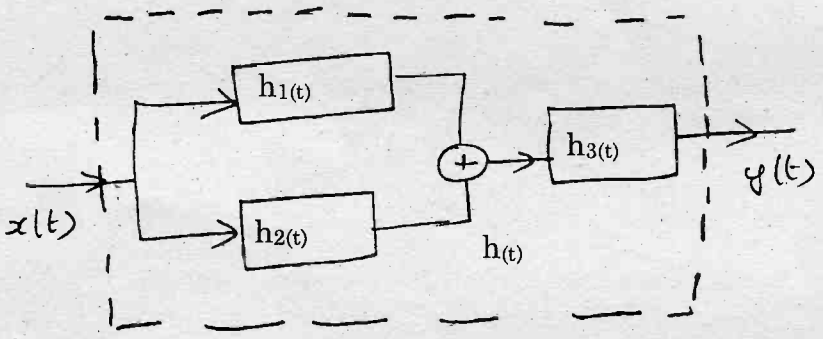


Plot the spectrum of the signal.

Or

(b) Find the spectrum of $x(t) = e^{-2|t|}$. Plot the spectrum of the signal.

13. (a) Find the overall impulse response of the following system.



Here $h_1(t) = e^{-2t}u(t)$

$h_2(t) = \delta(t) - \delta(t-1)$

$h_3(t) = \delta(t)$

Also find the output of the system for the input $x(t) = u(t)$ using convolution integral.

Or

(b) An LTI system is represented by $\frac{d^2}{dt^2}y(t)+4\frac{d}{dt}y(t)+4y(t)=x(t)$ with initial conditions $y(\overline{0})=0$; $y'(\overline{0})=1$; Find the output of the system, when the input is $x|t|=e^{-t}u(t)$.

14. (a) State and prove sampling theorem for a band limited signal.

Or

(b) Find inverse z-transform of $X(z)=\frac{z^{-1}}{1-0.25z^{-1}-0.375z^{-2}}$.

For (i) ROC $|z|>0.75$

(ii) ROC $|z|<0.5$

15. (a) Compute $y(n)=x(n)*h(n)$

where $x(n)=(1/2)^{-n}u(n-2)$

$h(n)=u(n-2)$.

Or

(b) LTI discrete time system $y(n)=3/2\,y(n-1)-1/2\,y(n-2)+x(n)+x(n-1)$ is given an input $x(n)=u(n)$

(i) Find the transfer function of the system.

(ii) Find the impulse response of the system.
