Code No. 6060 / M

FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II – Semester (Main) Examination, June 2014

Subject: Signal Analysis and Transform Techniques

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A

1 Is the signal x(t) shown in figure (1) below a power signal? (3)

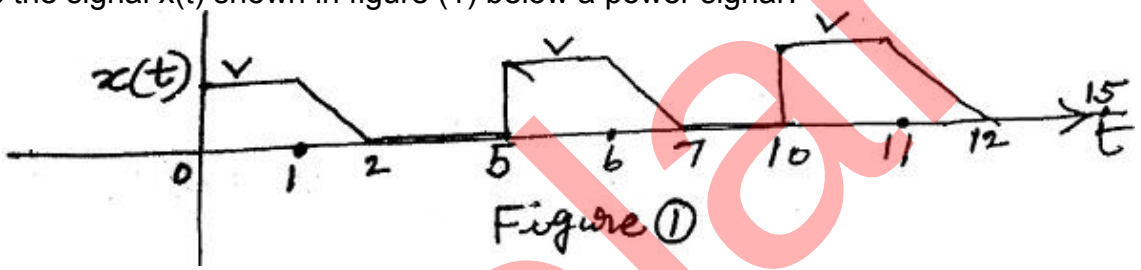

Figure ①

2 Test if the signal x(t) = 20 Sin $300\pi t+300\pi$ .Cos 20 πt is periodic or not. If periodic, find the time period. (2)

3 Find the Laplace transform and ROC of the signal x(t) = $2e^{-3t}u(+t)+4e^{5t}u(-t)$ (3)

4 Find the initial value and final value of the signal x(t) whose Laplace transform

$X(s) = \frac{10}{s^2+8s+15}$; Re(s) > -3. (2)

5 Find the discrete signal x[n] whose z-transform is $X(z) = \log\left(\frac{1}{1-az^{-1}}\right)$, |z| > a. (2)

6 Write any three properties of auto-correlation of discrete time signals. (3)

7 The transfer characteristic of a discrete system is given by y[n] = (n+1)x[n-1]. Test if the system is shift invariant. (2)

8 For a causal discrete time system when the input x(n) is δ (n-1) the output is Find the transfer function H(z) of the system $y(n) = 2^{(n-2)}$. (3)

9 Find the 4 point DFT of the discrete signal x[n] = [0, 1, -1, 0]. (3)

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10 State Dirichlett's conditions for Fourier series of a continuous time periodic signal. (2)

PART – B

11 Find the exponential Fourier series of the periodic signal $g_p(t)$ shown in figure 2. (10)

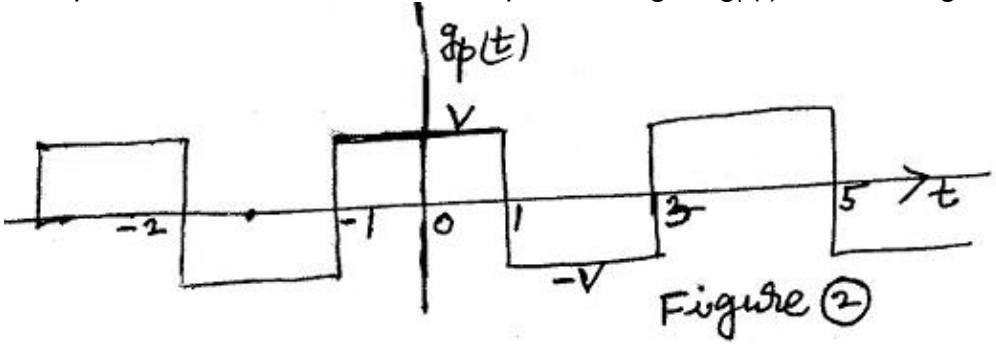

Figure ②

……2

12 (a) Find the Fourier transforms of the signals (i) x(t) = 10 Cos 400 π t (ii) x(t) = $10e^{-10t^2}$ (4)

(b) State and prove the following properties of Fourier transforms. (i) Modulation property (ii) Time scaling property (6)

13 (a) Find the transfer function and step-response h(t) of the system shown in figure 3. (5)

(b) the transfer curve of a discrete system is gtiven by y(n) = 5[x(n+1)]n. Test if the system is linear and causal.

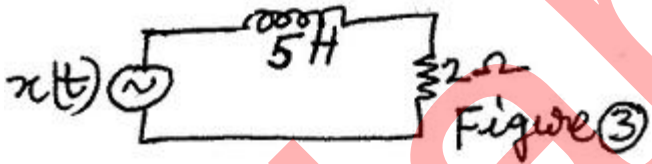

Figure ③

14 (a) Find the Laplace transform of the signal x(t) = $5t.e^{-3t}$. Cos 5t u(t). (5)

(b) State and prove the final value theorem in respect of Laplace transforms. Find the final value of the signal x(t) for which the unilateral Laplace transform is $\frac{10}{s^2+5s}$. (5)

15 (a) Find the Z-transform of the sequence $x[n] = a^n \quad 0 \le n \le N-1 \quad a > 0$
$= 0 \quad$ Otherwise (6)

(b) State and prove differentiation in z-domain property of Z-transforms. (4)

16 (a) Find the transfer function H(z) and the impulse response of the causal discrete system characterized by the difference equation y(n) – 2y(n-1)+y(n-2) = x(n)+x(n-1). (6)

(b) Find the convolution of the two discrete time signals shown below in figure 4. (4)

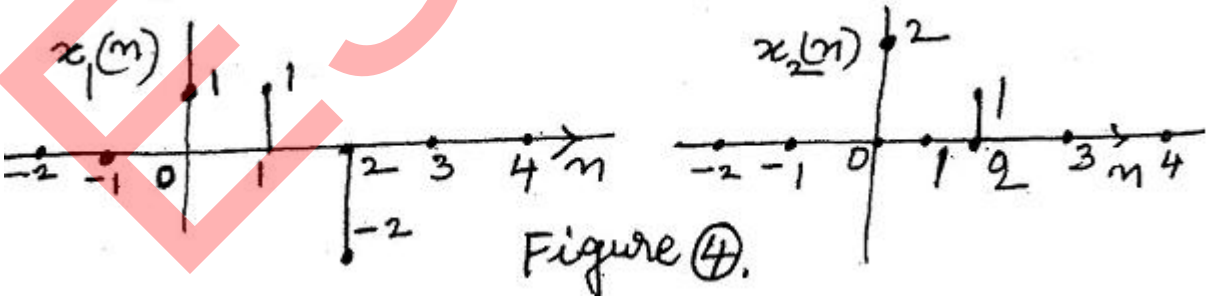

Figure ④.

17 (a) State and prove Parseval's identity for Fourier series of discrete signals. (4)

(b) Find the frequency response H(Ω) and impulse response h[n] of the discrete system described by the difference equation, y(n) - $\frac{3}{4}$y(n-1) = x(n). (6)

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