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EC36

Third Semester B.E. Degree Examination, Dec. 07 / Jan. 08

Signals & Systems

Time: 3 hrs. Max. Marks:100

Note :1. ***Answer any FIVE full questions.***
2. ***Missing parameters are to be suitably assumed.***

1 a. Distinguish between the following with suitable example:
i) Symmetric and Non-symmetric signals.
ii) The relationship between unit-step and unit-impulse function.
iii) Power and Energy signals. **(09 Marks)**

b. Determine whether the following signals are periodic or not, if so find their period:

i) $x(t)=\cos\left(t+\pi/4\right)$ ii) $x(t)=e^{j\left(\pi/2\, t-1\right)}$ iii) $x(t)=\cos t+\sin\sqrt{2}\,t$ **(06 Marks)**

c. Generate staircase signal $x(t)$ from signal $g(t)$. **(05 Marks)**

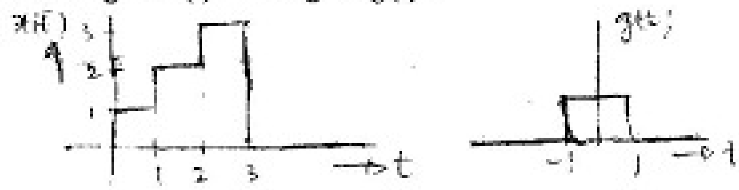

Fig. Q1 (c)

2 a. Explain the following properties of the system:
i) Stability ii) Linearity iii) Causality iv) BIBO v) Time Invariance **(08 Marks)**

b. Find $z(t)=x(2t)\cdot y(2t+1)$ where $x(t)$ and $y(t)$ are given as below: **(08 Marks)**

Fig. Q2(b)

c. Find the energy of the pulse given by $x(t)=\begin{cases}A & 0\le t\le T\\ 0 & \text{elsewhere}\end{cases}$ **(04 Marks)**

3 a. Evaluate : $y(n)=x(n)*h(n)$. Where $x(n)=\alpha^n u(n)$ and $h(n)=u(n)$, $0<\alpha<1$. **(08 Marks)**

b. Evaluate : $y(t)=u(t+1)*u(t-2)$. **(06 Marks)**

c. Show that i) $x(t)*\delta(t)=x(t)$ ii) $x(t)*\delta(t-t_0)=x(t-t_0)$ **(06 Marks)**

4 a. Find the impulse response of overall system shown in figure Q4 (a)

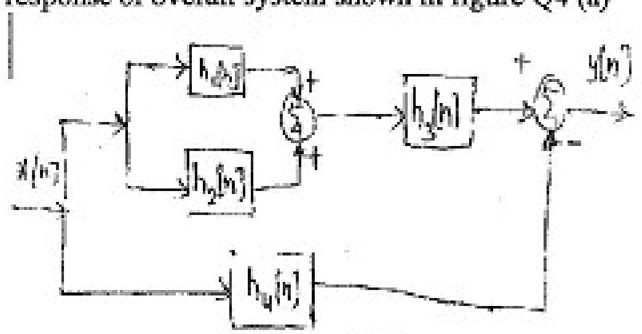

Fig. Q4(a)

Where $h_1(n)=u(n)$; $h_2(n)=u(n+2)-u(n)$; $h_3(n)=\delta(n-2)$; $h_4(n)=\alpha^n u(n)$ **(07 Marks)**

b. Draw the direct form I and direct form II implementations of the following difference equation,

$$y(n)+\frac{1}{4}y(n-1)-\frac{1}{8}y(n-2)=2x(n)+3x(n-1).$$ **(06 Marks)**

c. Find the forced response of the system shown in the figure Q4 (c), where $x(t)=\cos t$ **(07 Marks)**

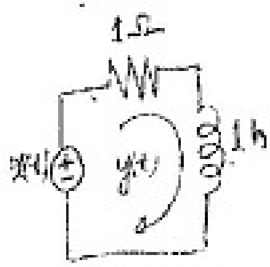

Fig. Q4 (c)

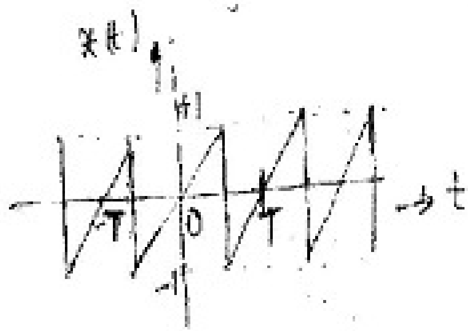

Fig. Q5 (a)

5 a. Find out the Fourier series of the following signal using trigonometric form. **(10 Marks)**

b. Evaluate the DTFS for $x(n)=\sin\left(\frac{4\pi}{21}n\right)+\cos\left(\frac{10\pi}{21}n\right)+1$. Sketch its magnitude and phase spectra. **(10 Marks)**

6 a. Prove the following properties of fourier transform

i) Time differentiation. ii) Time convolution. **(06 Marks)**

b. Find Fourier Transform of the following signal. **(08 Marks)**

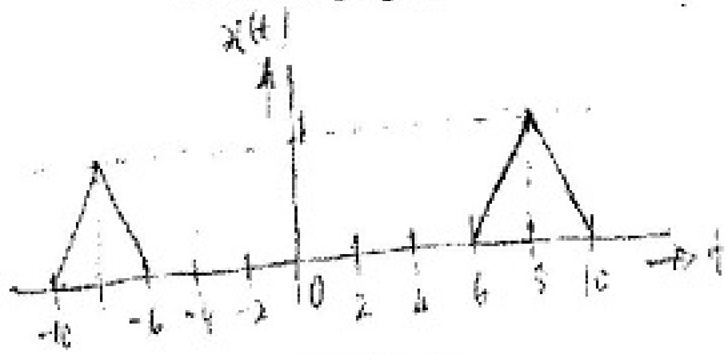

Fig. Q6 (b)

c. Find Inverse Fourier transform of $X(\omega)=\frac{j\omega+12}{(j\omega)^2+5j\omega+6}$ **(06 Marks)**

7 a. Determine Z transform and ROC of the following :

i) $x(n)=-\alpha^n u(-n-1)$ ii) $x(n)=\left(\frac{1}{3}\right)^n \sin\left(\frac{\pi}{4}n\right)u(n)$ **(10 Marks)**

b. Find the Inverse Z-transform of

i) $x(z)=\frac{z^4+z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{4}\right)}$ ROC: $\frac{1}{2}<|z|<\infty$ ii) $x(z)=\frac{z^{-1}}{-2z^2-z^{-1}+1}$ ROC: $1<|z|<2$

(10 Marks)

8 a. State and prove sampling theorem for low pass signals. **(10 Marks)**

b. Explain the properties of ROC of Z-transform. **(10 Marks)**

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