Code No: R21044 **R10** SET - 1

II B.Tech I Semester, Regular Examinations, Nov - 2011

SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

---

1. a) Verify the following signals sin $n\omega_0 t$ and sin $m\omega_0 t$ are orthogonal or not over the interval $(t_0, t_0 + 2\pi/\omega_0)$ (6M+9M)

   b) Approximate the function described below by a wave form sin t over the interval $(0,2\pi)$.The function is

   $f(t) = -1, \quad 0 < t < \pi$

   $= \quad 1, \pi < t < 2\pi$

   Also sketch the original function and approximated function

2. Discuss the concept of Trigonometric Fourier series and derive the expressions for coefficients. (15M)

3. a) Find the Fourier transform of symmetrical triangular pulse and sketch the Spectrum using properties (7M+8M)

   b) State and prove following properties of Fourier transform

   i) Time shifting

   ii) Time Scaling

4. a) Define transfer function (2M+7M+6M)

   b) Justify why ideal HPF cannot be realized.

   c) Find signal band width of (i) cos $100\pi t$ + cos $200\pi t$ and (ii) Sgn(t)

5. a) State and prove time Convolution property of Fourier transform (5M+6M+4M)

   b) Find the correlation of symmetrical gate pulse with amplitude and time duration '1' with itself.

   c) Evaluate u (t) * e^{-2t} u(t)

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

6. a) State and prove sampling theorem for band limited signals (11M+4M)

   b) Determine the minimum sampling rate and Nyquist interval of Sin (200t) + Sin(1000t)

7. a) Find Laplace transforms and sketch their ROC of

   i) x(t) = u(t – 5)

   ii) $x(t) = e^{j\omega_0 t} u(t)$ (8M+7M)

   b) Find the inverse Laplace transform of

   X(s) = (-5s – 7)/ [(s + 1) (s - 1) (s - 2)]

8. a) Find z – transform, ROC and pole – zero locations of $x(n) = a^n u(-n-1)$ (5M+4M+6M)

   b) State and prove differentiation in z – domain property

   c) Find the inverse z – transform of

   $X(z) = \frac{1}{(1-0.2z^{-1})} + \frac{2}{(1-z^{-1})}$. Assuming signal is causal

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

Code No: R21044 **R10** SET - 2

II B.Tech I Semester, Regular Examinations, Nov - 2011

SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

---

1. a) Define and Sketch the
   i) Impulse
   ii) Double sided exponential
   iii) Step function
   iv) Signum function (4M+11M)

   b) Approximate the function described below by a wave form sin rt, where 'r' value is '4'over the interval (0, 2 π). The function is

   $f(t) = -1,\ 0 < t < \pi$

   $= 1,\ \pi < t < 2\pi$

   Also sketch the original function and approximated function

2. a) Derive the relations between exponential and trigonometric Fourier series coefficients
   b) Explain about Dirichlet's conditions (6M+9M)

3. a) Find the Fourier transform of
   i) Symmetrical gate pulse
   ii) sgn(t) (9M+6M)
   b) State and prove symmetry property of Fourier transform

4. a) Explain the conditions required for distortion less transmission (8M+7M)
   b) Define system bandwidth and signal bandwidth, compare them with the help of examples

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

5. a) State and prove properties of Auto – Correlation (7M+8M)

   b) Prove the following

   i) $\delta(t) * \delta(t - t_1) = \delta(t - t_1)$

   ii) $f(t - t_1) * \delta(t - t_2) = f(t - t_1 - t_2)$

   iii) $\delta(t - t_1) * \delta(t - t_2) = \delta(t - t_1 - t_2)$

6. a) State and prove sampling theorem for band limited signals using graphical approach

   b) What is aliasing? (11M+4M)

7. a) Find the Laplace transform of

   $x(t) = e^{-(t-1)} (t - 1) u(t - 1)$ (6M+5M+4M)

   b) Find the initial and final values of signal x(t) whose Laplace transform is

   $X(s) = (5s + 1)/[s(s + 2)]$

   c) Find inverse of following Laplace transform

   $$X(s) = \frac{1}{s+1} - \frac{2}{s-1}, \quad \text{If ROC is } 1 < \text{Re}(s)$$

8. a) Find z – transform, ROC and pole – zero locations of

   $x(n) = a^n u(n)$ (6M+4M+5M)

   b) State and prove z –transform time reversal property

   c) Find the inverse z – transform of

   $$X(z) = \frac{1}{(1+z)} + \frac{2z}{(z-0.2)}$$

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

Code No: R21044 **R10** SET - 3

II B.Tech I Semester, Regular Examinations, Nov - 2011

SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

---

1. a) Verify the following signals cos $n\omega_0 t$ and cos $m\omega_0 t$ are orthogonal or not over the interval $(t_0 , t_0 + 2\pi /\omega_0)$ (5M+5M+5M)
   b) Explain why mean square error is preferred in signal approximations
   c) Express the Impulse function interms of sampling function and explain

2. a) Expand following function f(t) by exponential Fourier series over the interval (0, 2). In this interval f(t) is expressed as
   f (t) = At (9M+6M)
   b) Prove that discrete magnitude spectrum is symmetrical about vertical axis whereas phase spectrum anti-symmetrical about vertical axis

3. a) Find Fourier transform of Cos $\omega_0 t$ (7M+8M)
   b) State and prove following properties of Fourier transform
      i) Frequency shifting
      ii) Symmetry

4. a) Derive the relationship between system bandwidth and signal rise time (9M+6M)
   b) Sketch and explain the frequency response of ideal LPF, HPF, BPF and BRF.

5. a) Derive the expression for energy in frequency domain (7M+8M)
   b) Find the Convolution of following signals
   $f_1(t) = 1, 0 \leq t \leq 3$
   $= 0$, other wise
   $f_2(t) = t, \ 1 \leq t \leq 6$
   $= 0$, other wise

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

6. a) Sketch the spectrum of naturally sampled signal for following cases

   i) $\omega_0 = 2\ \omega_m$

   ii) $\omega_0 > 2\ \omega_m$

   iii) $\omega_0 < 2\ \omega_m$

   Where 'ω_0' is frequency corresponding to sampling interval and 'ω_m' is maximum frequency in the spectrum of base band signal. Explain the each sketch (8M+7M)

   b) Explain how original signal can be recovered from sampled signal.

7. a) Describe the ROC of the signal

   $x(t) = e^{-b|t|}$, for $a > 0$ and $a \leq 0$ (8M+7M)

   b) Find the inverse Laplace transform of

   $$X(s) = \frac{(-5s-7)}{(s+1)(s-1)(s-2)}$$, When ROC is $1 < \text{Re}(s) < 2$

8. a) Determine z – transform, pole – zero locations and sketch of ROC of following signal

   $x(n) = -u(-n-1) + (1/5)^n u(n)$ (8M+7M)

   b) Find the inverse z – transform of

   $$X(z) = \frac{(2+z^{-1})}{(1-0.2z^{-1})}$$, with ROC $|z| > 1/5$ using power series expansion

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

Code No: R21044 **R10** SET - 4

II B.Tech I Semester, Regular Examinations, Nov - 2011

SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

---

1. a) Verify the following signals cos $n\omega_0 t$ and sin $m\omega_0 t$ are orthogonal or not over the interval $(t_0 , t_0 + 2\pi/\omega_0)$ (6M+9M)
   b) Explain
   i) How signum function is expressed in terms of unit step function
   ii) How Step function is expressed in terms of Impulse
   iii) How Impulse function is expressed in terms of Step

2. a) Consider full rectified sine wave with peak amplitude '1' and time period is '1', expand this function interms of exponential Fourier series. Also sketch the spectrum (11M+4M)
   b) Express the trigonometric Fourier series coefficient 'b_n' interms of exponential Fourier series coefficient 'F_n'

3. a) Find the Fourier transform periodic impulse train (8M+7M)
   b) Find Fourier transform of sin $\omega_0 t$

4. a) Discuss the Poly-wiener criterion for physical realization of systems. (7M+4M+4M)
   b) Compare signal bandwidth and system bandwidth.
   c) Find band width of sin $200\pi t$ + cos $2000\pi t$

5. a) Derive the expression for power in frequency domain (7M+8M)
   b) Find the Auto – Correlation of f(t) = cos $\omega_0 t$ and sketch

6. a) Distinguish natural and flat top samplings (6M+5M+4M)
   b) Explain the effect of under sampling
   c) Determine the minimum sampling rate and Nyquist interval of cos (200t) + cos(2000t)

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.

7. a) For the signal given below and check the possibility of finding Laplace transform by sketching ROC

   $x(t) = e^{-t}\, u(t) + e^{-2t}\, u(-t)$ (8M+7M)

   b) Find the inverse Laplace transform of

   $X(s) = 4s^2 + 15s + \dfrac{8}{(s+2)^2(s+1)}$ .Assuming signal is causal.

8. a) Determine z – transform, pole – zero locations and sketch of ROC of following signal

   $x(n) = (1/3)^n\, u(n) + (-1/2)^n\, u(n)$ (8M+7M)

   b) Find the inverse z – transform of

   $X(z) = 1 - z^{-1} + \dfrac{z^{-2}}{(1-0.2z^{-1})(1-2z^{-1})(1-z^{-1})}$, with ROC of $0.2 < |z| < 1$

Please purchase PDF Split-Merge on www.verypdf.com to remove this watermark.