C 80686 **(Pages : 2)** Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, APRIL 2015

EE 09 403/PTEE 09 402—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 70 Marks

Part A

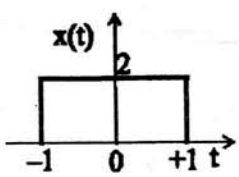
All questions are *compulsory* :

1. Differentiate between deterministic and random signals.
2. State Parseval's theorem for continuous time periodic signals.
3. Define frequency response of continuous time systems.
4. Find the Fourier transform of $e^{at}\, u(t)$.
5. The system function of a stable causal system is $1/(1 - a\, z^{-1})$. Find its impulse response.

(5 × 2 = 10 marks)

Part B

Answer any *four* questions :

1. An analog signal $x(t)$ is given by : 

Then sketch the following :

   (a) $3\, x\,[3\,(t-1)]$. (2.5 marks)

   (b) $x\,(2t-3)+1$. (2.5 marks)

2. Determine the output of an LTI system with impulse response $h(t) = u(t)$ to an input $x(t) = e^{at}$.
3. Starting from the constant coefficient differential equation of a typical system, derive the transfer function. Comment on its stability.
4. Define DTFT and prove its convolution property.
5. Bring out the relationship between DTFT and Z-transform.
6. With a simple example, explain the partial fraction method of computing inverse Z-transform.

(4 × 5 = 20 marks)

Part C

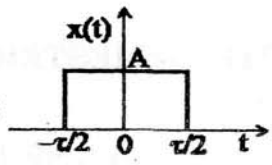
1. (a) Starting from fundamentals, prove that the output of an LSI system can be represented by the convolution sum.

Or

   (b) With typical examples, bring out the classification of signals.

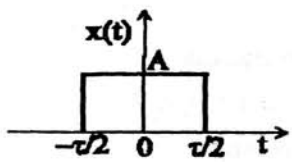
Turn over

2. (a) Define CTFT. Compute and plot the CTFT of the given signal :



Or

(b) Define the multiplicative property of CTFT. Hence compute the CTFT of $x(t) \cos 2\pi f_c t$ where $x(t)$ is given by :



3. (a) Find the DTFT of the sequence $x(n) = 1$, for $n = 0, 1, 2, \ldots n-1$.

0 , otherwise.

Or

(b) State and prove sampling theorem.

4. (a) Find the Z-transform of :

(i) $x_1(n) = 0.5^n\, u(n)$.

(ii) $x_2(n) = -0.2^n u(-n-1)$.

Or

(b) Explain the residue method of computing the inverse Z-transform.

(4 × 10 = 40 marks)