RAJ KUMAR GOEL INSTITUTE OF TECHNOLOGY & MANAGEMENT, GZB

1st Sessional Examination 2017-18 (Odd Semester)

Roll No.: **Subject Name: Signal & Systems**

Year/Branch: **II / Electronics & Comm.** **Subject Code: REC303**

Max Time: 1Hours 30 Minute **Max Marks: 50**

SECTION-A

Q.1 Attempt all parts carry equal marks. Write answer of each part in short. (2x5=10)

(a) Show that the product of two odd signals is an even signal.

(b) Determine the value of: $\int_{-\infty}^{\infty} x(t)\delta(at-b)dt$.

(c) $u[n]$ is energy signal or power signal?

(d) State the condition for causality and stability of continuous-time LTI system in terms of ROC of its system function.

(e) Calculate $u[n]+u[-n]$ in term of $\delta[n]$ and some constant.

SECTION-B

Note: Attempt any five questions from this section. (5x5=25)

Q.2 Find the even and odd part of the signals:

a) $x(t) = e^{-t}u(t)$ **b)** $x[n] = \begin{cases} n\,; & 1 \le n \le 3 \\ 0\,; & otherwise \end{cases}$

Q.3 Determine whether or not each of the following signals is periodic. If the signal is periodic, determine its fundamental period

a) $x(t) = \cos(t) + \sin(\sqrt{2}t)$ **b)** $x[n] = 3\cos(0.5\pi n)$

.**Q.4** Given discrete time system y(n)= x(-n+2) and y(n) = x(n)+nx(n+1) , Comment on linearity, causality, time variance and static or dynamic nature.

Q.5 Given $x_1(t) = u(t+2) - u(t-1)$ and $x_2(t) = u(t) - u(t-3)$. Sketch $x_1(t) * x_2(t)$.

Q.6 (a) Prove that $R_{yx}(\tau) = R_{xy}(-\tau)$ for real valued signals.

(b) Establish the relationship between convolution and correlation function of continuous-time system.

Q.7 For first order low pass filter, evaluate the impulse response and step response.

Q.8 Determine the system function and specify the ROC for the LTI system with following differential equation:

$$6y''(t) + 11y'(t) + 5y(t) = 2x'(t) + x(t)$$

Also determine the response of the system with unit step input signal when zero initial conditions is applied.

Q.9 Find the initial and final values of the following functions.

a) $X_1(s) = \dfrac{s+2}{s^2+2s-3}$ **b)** $X_2(s) = \dfrac{4s^2+3s+2}{7s^2+6s+5}$

SECTION-C

Note: Attempt any two questions from this section. **(7.5x2=15)**

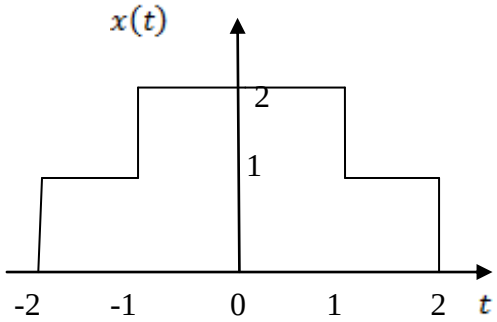
Q.10 Determine the inverse Laplace transform of following $X(s)$:

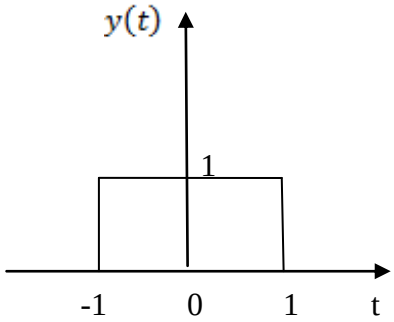
a) $X(s) = \frac{1}{s(s+1)^2}; Re\{s\} < -1$ **b)** $X(s) = \log[\frac{s+5}{s+6}]$.

Q.11 Calculate the Laplace transform and also discus causality and stability of following system with impulse response as:

a) $h(t) = e^{-|t|}$ **b)** $g(t) = 3e^{-7t}u(t) - 12e^{4t}u(-t)$

Q.12 (a) Represent the following signal $x(t)$ in terms of step functions.





(b) Represent $x(t)$ in terms of y(t) and its shifted version.

(c) Explain various operation over signal and sketch:

$(i)\ x(t-2)$ $(ii)x(2t+3)$ $(iii)x(\frac{3}{2}t)$