RNS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MATHEMATICS
TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES
18MAT31
ASSISGNMENT-I (THIRD SEMESTER)

Common to all branches **Submission date: 06/10/2020**

1) Find $L[e^{-2t}tcos2t]$
2) Express the function in terms of unit step function and hence find Laplace transform of:
$$f(t) = \begin{cases} 1 & 0 \le t \le 1 \\ t & 1 < t \le 2 \\ t^2 & t > 2 \end{cases}$$
3) Solve the equation $y''(t) + 3y'(t) + 2y(t) = 0$ under the condition $y(0) = 1, y'(0) = 0$.
4) Find (i) $L^{-1}[\frac{s+3}{s^2-4s+13}]$ (ii) $L^{-1}[log\frac{s^2+1}{s(s+1)}]$
5) Find $L^{-1}[\frac{s^2}{(s^2+a^2)^2}]$ using convolution theorem
6) A periodic function of period $2a$ is defined by
$$f(t) = \begin{cases} E & 0 \le t \le a \\ -E & a < t \le 2a \end{cases}$$
Where E is the constant and show that $L[f(t)] = \frac{E}{s}tanh\left(\frac{as}{2}\right)$.
7) Find the Laplace transform of $L[tsint]$.
8) Find the inverse Laplace transform of $\left[\frac{s+5}{s^2-6s+13}\right]$.
9) Find the inverse Laplace transform of $\left[\frac{s}{(s^2+1)(s^2+4)}\right]$ using convolution theorem
10) Find (i) $L^{-1}[\frac{s}{(s-1)(s^2+4)}]$ (ii) $L^{-1}[tan^{-1}(s)]$
11) Find the Laplace transform of (i) $\sqrt{e^{4(t+3)}}$ (ii) $e^{-2t}sin3t$ (iii) $\frac{1-cost}{t}$
12) Find (i) $L^{-1}[\frac{3s+2}{s^2-s-2}]$ (ii) $L^{-1}[cot^{-1}(\frac{s}{a})]$
13) The triangular wave function $f(t)$ with period $2a$ is defined by
$$f(t) = \begin{cases} t & 0 \le t \le a \\ 2a - t & a < t \le 2a \end{cases}$$
Show that $L[f(t)] = \frac{1}{s^2}tanh\left(\frac{as}{2}\right)$.
14) Using Laplace transform method solve $y''(t) + 2y'(t) + 2y(t) = 5sint$ under the condition $y(0) = 0,\ y'(0) = 0$.
15) Express the function in terms of unit step function and hence find Laplace transform of:
$$f(t) = \begin{cases} sint & 0 \le t \le \frac{\pi}{2} \\ cost & t > \frac{\pi}{2} \end{cases}$$