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City & Guilds

9209-513 NOVEMBER 2015
Level 5 Advanced Technician Diploma in Mechanical Engineering
Advanced Engineering Mathematics

Monday 16 November 2015
09:30 – 12:30

Do not write your answers in this booklet as this will not be marked. All answers should be written in the space provided on the question paper.

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Short Table of Laplace Transforms

$f(t)$	$F(s) = \int_0^\infty f(t)e^{-st}dt$
$af_1(t) + bf_2(t)$	$aF_1(s) + bF_2(s)$
$\frac{d}{dt}f(t)$	$sF(s) - f(0)$
$\frac{d^2}{dt^2}f(t)$	$s^2F(s) - sf(0) - \frac{df(t)}{dt}(0)$
Initial value: $f(t), t \to 0$	$sF(s), s \to \infty$
Final value: $f(t), t \to \infty$	$sF(s), s \to 0$
Unit step: $H(t)$	$\frac{1}{s}$
Constant: c	$\frac{c}{s}$
t	$\frac{1}{s^2}$
$\frac{1}{2}t^2$	$\frac{1}{s^3}$
$e^{-\alpha t}$	$\frac{1}{s+\alpha}$
$te^{-\alpha t}$	$\frac{1}{(s+\alpha)^2}$
$\sin \omega t$	$\frac{\omega}{s^2+\omega^2}$
$t \sin \omega t$	$\frac{2\omega s}{(s^2+\omega^2)^2}$
$e^{-\alpha t} \sin \omega t$	$\frac{\omega}{(s+\alpha)^2+\omega^2}$
$\cos \omega t$	$\frac{s}{s^2+\omega^2}$
$t \cos \omega t$	$\frac{s^2-\omega^2}{(s^2+\omega^2)^2}$
$e^{-\alpha t} \cos \omega t$	$\frac{s+\alpha}{(s+\alpha)^2+\omega^2}$