KING ABDULAZIZ UNIVERSITY DEPARTMENT OF MATHEMATICS

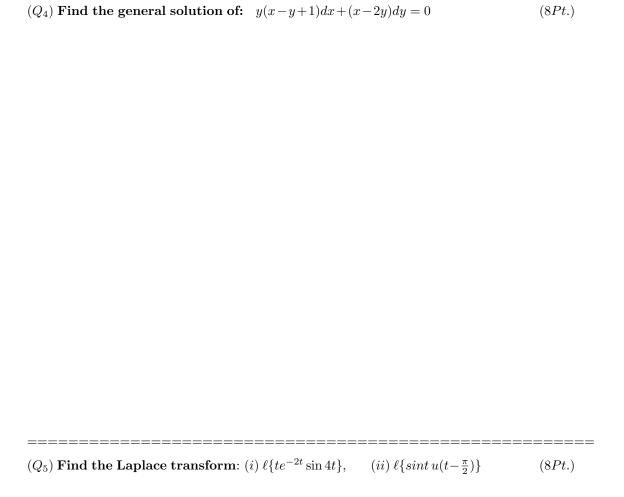
Exam/Course: Final Exam - Math-204

Student Name:	Student University Number:				
Instructor Name:	Section:				
Time Allowed: 120 Minutes	Jan. 20, 2011				
(Q1) Select the correct response:					
(i) The D.E. $x \frac{dy}{dx} = y e^{\frac{x}{y}} - x$ is					
\square exact \square Ricatti \square homogeneous	(2Pt.)				
(ii) The D.E. $(x+1)\frac{dy}{dx} = y - 1 + x^2$ is					
\Box linear \Box Bernoulli \Box separable	(2Pt.)				
(iii) $y = \frac{\pi}{2}$ is the unique solution of (IVP): $y' + 2x$ co	os $y = 0; \ y(1) = \frac{\pi}{2}$				
\Box true \Box false	(2Pt.)				
(iv) There is a particular solution of $y' + P(x)y = Q(x)$	$f(x)$ in the form $\int Q(t)e^{\int P(t)dt}dt$				
\Box true \Box false	(2Pt.)				
(v) The function $f(t) = t^{-2}$ is not piecewise continuo	ous				
\Box true \Box false	(2Pt.)				
(vi) The function $f(t) = \sin t$ is not of exponential or	rder				
\Box true \Box false	(2Pt.)				
(vii) The function $F(s) = \ln(\frac{s}{s+4})$ is the Laplace tran	sform of a function that is piecewise con-				
tinuous and of exponential order					
\Box true \Box false	(2Pt.)				
$(viii)\ \ell^{-1}\{F(s)G(s)\} = f(t)g(t)$					
\Box true \Box false	(2Pt.)				

 (Q_2) A mass weighing 8 pounds is attached to a 7-feet-long spring. At equilibrium the spring measures 3 feet. If the mass is initially released from the rest at a point 2 feet below the equilibrium position. Find the displacements x(t) if it is further known that the surrounding medium offers a resistance numerically equal to $\frac{3}{2}$ times the instantaneous velocity. (10Pt.)

 (Q_3) Find the general solution of: $y''-2y'+y=e^tsin^{-1}t$

(10Pt.)



 $(Q_6) \ {\bf Find \ the \ inverse \ Laplace \ transform:} \ (i) \ \ell^{-1}\{\tfrac{1}{(s^2+1)^2}\}, \qquad (ii) \ \ell^{-1}\{\tfrac{e^{-\pi s}}{s^2+2s+2}\} \ \ (10Pt.)$

 $(Q_7) \ \mathbf{Use\ Laplace\ transform\ to\ solve:}\ y''+y=g(t);\ y(0)=1,\ y'(0)=2, \eqno(10Pt.)$

$$g(t) = \begin{cases} 0 & \text{if } 0 \le t \le \frac{\pi}{2}, \\ \sin t & \text{if } t > \frac{\pi}{2}. \end{cases}$$

Answer only one of the following two questions:

$$(Q_8)$$
 Solve: $\frac{dy}{dx} = \frac{1-y^2}{1-x^2}$; $y(0) = 0$ (8Pt.)

$$(Q_9)$$
 Solve: $\frac{dy}{dx} = xy^{-\frac{1}{2}} - y; \ y(0) = 9$ (8Pt.)

Q1	$\mathbf{Q2}$	Q3	Q4	$\mathbf{Q5}$	Q 6	Q7	$\mathbf{Q8}$	Q 9	Sum	Bal.