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. $\frac{dy}{dx} = \frac{y^2 - x^2}{x^2 + y^2}$ is					
\square exact \square homogeneous \square separable	(2Pt.)				
(ii) The D.E. $dx = (xy^2 - y)dy$ is					
\square Ricatti \square linear \square Bernoulli	(2Pt.)				
(iii) $y = 1$ is the unique solution of (IVP): $\frac{dy}{dx} = y \ln y$; y(0) = 1				
\Box true \Box false	(2Pt.)				
(iv) There is a particular solution of $y' + P(x)y = Q(x)$	(x) in the form $\int Q(t)e^{\int P(t)dt}dt$				
\Box true \Box false	(2Pt.)				
(v) The function $f(t) = \frac{\sin t}{t}$ is piecewise continuous					
\Box true \Box false	(2Pt.)				
(vi) The function $f(t) = e^{t^2}$ is of exponential order					
\Box true \Box false	(2Pt.)				
(vii) The function $F(s) = \frac{s^2}{s^2+4}$ is not the Laplace tr	ransform of a function that is piecewise				
continuous and of exponential order					
\Box true \Box false	(2Pt.)				
$(viii)\ \ell^{-1}\{F(s)G(s)\} = \ell^{-1}\{F(s)\}\ell^{-1}\{G(s)\}$					
\Box true \Box false	(2Pt.)				

 (Q_2) A mass weighing 16 pounds is attached to a 5-feet-long spring. At equilibrium the spring measures 8.2 feet. If the mass is initially released from the equilibrium position with an upward velocity 3 feet per second. Find the displacements x(t) if it is further known that the surrounding medium offers a resistance numerically equal to the instantaneous velocity. (10Pt.)

 (Q_3) Find the general solution of: $y'' + 2y' + y = e^{-t}tan^{-1}t$ (10Pt.)



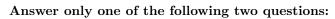
(8Pt.)

 (Q_4) Find the general solution of: $(2y^2+3x) dx+2xy dy=0$

(Q₅) Find the Laplace transform: (i)
$$\ell \{te^{2t}\cos 3t\}$$
, (ii) $\ell \{\int_0^t \sin \tau \sin(t-\tau)d\tau\}$ (8Pt.)

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

(Q₇) Use Laplace transform to solve: $\frac{d^2x}{dt^2} + \omega^2 x = F_0 \sin \omega t$; x(0) = 1, x'(0) = 1, (10Pt.)



$$(Q_8)$$
 Solve: $(1+x^4)dy+x(1+4y^2)dx=0; y(1)=0$ (8Pt.)

(Q₉) Solve: $t^2 \frac{dy}{dt} + y^2 = ty$; y(1) = 1 (8Pt.)

Q1	$\mathbf{Q2}$	$\mathbf{Q3}$	$\mathbf{Q4}$	$\mathbf{Q5}$	$\mathbf{Q6}$	Q7	$\mathbf{Q8}$	$\mathbf{Q}9$	Sum	Bal.