MODEL: *A*

Student Name: **Student University Number:**

Instructor Name: **Section:**

Time Allowed: 90 Minutes   **October 30, 2010**

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($Q1$) **Select the correct response with writing the details:**

(i) The D.E. $(2x + 3y - 2)y' = 1$ is

□ separable   □ Bernoulli □ linear   ($2Pt.$)

(ii) The D.E. $y' = y(1 - y)$ has the solution $y = 0$ as

□ a singular solution   □ a particular solution   ($5Pt.$)

(iii) The D.E. $(1 + \frac{3}{x} + y)\frac{dx}{dy} = N(x,y)$ is exact if

□ $N(x,y) = C(y) + x$ □ $N(x,y) = C(y) - x$ □ $N(x,y) = C(x) + y$ ($3Pt.$)

(iv) According to the Existence and Uniqueness Theorem the IVP: $y' = \sqrt{xy}$; $y(0) = 0$ has

□ one solution   □ an infinitely many solutions   □ no solution   (5 Pt.)

(Q_2) A large tank is filled to capacity with 300 liters of pure water. Brine containing 2 grams of salt per liter is pumped into the tank at a rate of 4 liters per minute. The well mixed solution is pumped out at a rate 3 liters per minute. Find the number A(t) of grams of salt in the tank at time t. $(8Pt.)$

(Q_3) An electromotive force

$$E(t) = \begin{cases} 200 & \text{if } 0 \le t \le 10, \\ 0 & \text{if } t > 10. \end{cases}$$

is applied to an LR series circuit in which the inductance is 40 henries and the resistance is 8 ohms. Find the current $i(t)$ if $i(0) = 0$. (9Pt.)

Answer only three of the following four questions:

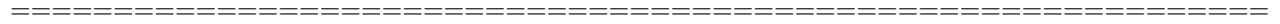(Q_4) **Solve:** $y' = sin(x+y); \ y(0) = \frac{\pi}{4}$ (6Pt.)

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(Q_5) **Solve:** $ydx+x(\ln x-\ln y-1)dy = 0,$ (6Pt.)

(Q_6) **Solve:** $\frac{dy}{dx} = -2x^2 + \frac{1}{x}y + 2y^2; \ y_1 = x,$ $\hspace{4cm}$ $(6Pt.)$

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(Q_7) **Solve:** $x\frac{dy}{dx} = 2x\,e^x - y + 6x^2,$ $\hspace{4cm}$ $(6Pt.)$

Q1	Q2	Q3	Q4	Q5	Q6	Sum	adapted points