MODEL: A

KING ABDULAZIZ UNIVERSITY

DEPARTMENT OF MATHEMATICS

Exam/Course: Exam I - Math-204

Student Name: **Student University Number:**

Instructor Name: **Section:**

Time Allowed: 90 Minutes **March 27, 2011**

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

(i) The D.E. $(x^2+4)\,dy = (2x - 8xy^2)\,dx$ is

☐ exact ☐ homogeneous ☐ separable ($2Pt.$)

(ii) The D.E. $dx = (xy^2 - y)dy$ is

☐ Ricatti ☐ linear ☐ Bernoulli ($2Pt.$)

(iii) The D.E. $(1 + \frac{y}{x} + lnx)dx = (1 - lnx)dy$ is

☐ exact ☐ homogeneous ☐ separable ($2Pt.$)

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

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

(v) 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 of fluid in which 30 pounds of salt is dissolved. 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. ($8Pt.$)

the reaction is proportional to the product of the instantaneous amounts of A and B not converted to chemical C. Initially, there are 50 grams of A and 32 grams of B, and for each grams of A, 4 grams of B is used. It is observed that 10 grams of C is formed in 5 minutes. How much is formed in 20 minutes? what is the limiting amount of C after a long time?. ($8Pt.$)

(Q_4) **Solve:** $y^{\frac{1}{2}}\frac{dy}{dx}+y^{\frac{3}{2}}=x;\ y(0)=4$ ($6Pt.$)

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(Q_5) **Solve: Solve:** $\frac{dy}{dx}=\sqrt{\frac{1-y^2}{1-x^2}};\ y(1)=0$ ($6Pt.$)

(Q_6) **Solve:**

$$\frac{dy}{dx}+y=f(x),\quad y(0)=0, f(x)=\begin{cases}1 \text{ if } 0\leq x\leq 1,\\ 0 \text{ if } x>1.\end{cases} \qquad (6Pt.)$$

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(Q_7) **Solve:** $\frac{dy}{dx}=1+\sqrt{y-x+3}$, $(6Pt.)$

Q1	Q2	Q3	Q4	Q5	Q6	Sum	Balanced points