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KING ABDULAZIZ UNIVERSITY

DEPARTMENT OF MATHEMATICS

Exam/Course: Exam I - Math-204

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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. $x\frac{dy}{dx} = y\,e^{\frac{x}{y}} - x$ is

□ exact   □ Ricatti □ homogeneous $(2Pt.)$

(ii) The D.E. $(x+1)\frac{dy}{dx} = y - 1 + x^2$ is

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

(iii) The D.E. $ydx = (y^2 - x)dy$ is

□ exact   □ Ricatti □ linear $(2Pt.)$

(iv) The D.E. $y' = y^2 - 1$ has the solution $y = -1$ as

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

(iv) According to the **Existence and Uniqueness Theorem** the IVP: $y' = xy^{\frac{1}{2}}$; y(0)=1 has

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

(Q_2) A large tank is filled to capacity with 200 gallons of fluid in which 30 pounds of salt is dissolved. Brine containing 2 pounds of salt per gallon is pumped into the tank at a rate 4 gallons per minute. The well mixed solution is pumped out at the same rate. Find the number A(t) of pounds of salt in the tank at any time t. (8$Pt.$)

converted to chemical C. Initially, there are 50 grams of A and 32 grams of B, and for each grams of B, 1 gram of A 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?. (8*Pt.*)

(Q_4) **Solve:** $\quad \frac{dy}{dx} = xy^{-\frac{1}{2}} - y; \; y(0) = 9$ $\hspace{4cm}$ $(6Pt.)$

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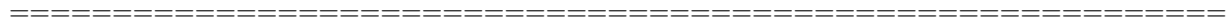
(Q_5) **Solve:** $\quad \frac{dy}{dx} = \frac{1-y^2}{1-x^2}; \; y(0) = 0$ $\hspace{4cm}$ $(6Pt.)$

(Q_6) **Solve**

$$\frac{dy}{dx} + y = f(x), \quad y(0) = 0, f(x) = \begin{cases} 20 \text{ if } 0 \leq x \leq 2, \\ 0 \quad \text{if } x > 2. \end{cases}$$

(6Pt.)

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(Q_7) **Solve** $\frac{dy}{dx} = 2 + \sqrt{y - 2x}$,

(6Pt.)

Q1	Q2	Q3	Q4	Q5	Q6	Sum	Balaced points