

MODEL: B

KING ABDULAZIZ UNIVERSITY  
DEPARTMENT OF MATHEMATICS  
Exam/Course: Exam I - Math-204

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.  $\frac{dy}{dx} = \frac{1}{x(x-y)}$  is

separable     Bernoulli     linear

(2Pt.)

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

a singular solution     a particular solution

(5Pt.)

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

$M(x, y) = C(x) + y$       $M(x, y) = C(x) - y$       $M(x, y) = C(y) + x$

(3Pt.)

(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  $t$ .

(8Pt.)

(Q<sub>3</sub>) An electromotive force

$$E(t) = \begin{cases} 80 & \text{if } 0 \leq t \leq 20, \\ 0 & \text{if } t > 20. \end{cases}$$

is applied to an LR series circuit in which the inductance is 10 henries and the resistance is 1 ohms. Find the current  $i(t)$  if  $i(0) = 0$ . (9Pt.)

Answer only three of the following four questions:

(Q<sub>4</sub>) Solve  $y' = \cos(x+y)$ ,  $y(0) = \frac{\pi}{4}$

(6Pt.)

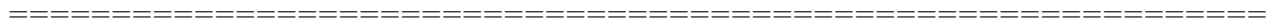
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(Q<sub>5</sub>) Solve  $xy' = y \ln\left(\frac{x}{y}\right)$ ,

(6Pt.)

(Q6) Solve  $\frac{dy}{dx} = -\frac{4}{x^2} - \frac{1}{x}y + y^2; y_1 = \frac{2}{x}$ ,

(6Pt.)



(Q7) Solve  $(x+2y)y' = 1$ ,

(6Pt.)

Q1	Q2	Q3	Q4	Q5	Q6	Sum	adapted points