

MODEL: A

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

Student Name:

Student University Number:

Instructor Name:

Section:

Time Allowed: 90 Minutes

December 25, 2010

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

(i) If  $y_1, y_2, \dots, y_n$  is any set of  $n$  linearly independent solutions of a homogeneous linear differential equation of order  $n$ , then  $y = C_1y_1 + C_2y_2 + \dots + C_ny_n$  is

a solution     the general solution     not a solution    (3Pt.)

(ii) A particular solution  $y_p$  of  $y'' - 2y' + y = (x + 1)e^x$  is of the form

$(Ax+B) \exp x$       $(Ax^2+Bx) \exp x$       $(Ax^3+Bx^2) \exp x$     (5Pt.)

(iii) The general solution of  $y'' = 0$  is

a polynomial function     an exponential function     a trigonometric function    (3Pt.)

(iv) According to the **Existence and Uniqueness Theorem** IVP:

$(x - 1)^2y'' - 2(x - 1)y' + 2y = 12$ ,  $y(1) = 6$ ,  $y'(1) = 1$  has

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

(Q<sub>2</sub>) **Solve**

$$\begin{cases} \frac{dx}{dt} = x - y \\ \frac{dy}{dt} = 3x - y \\ x\left(\frac{\pi}{\sqrt{2}}\right) = 0, \quad y\left(\frac{\pi}{\sqrt{2}}\right) = 1. \end{cases}$$

(11 Pt.)

(Q<sub>3</sub>) Find the general solution of:  $4y'' + 4y' + y = e^{-\frac{x}{2}} \sqrt{1-x^2}$

(11Pt.)

**Answer only two of the following three questions:**

**(Q<sub>4</sub>) Find the general solution of:**  $xy'' - (x+1)y' + y = 0$ ;  $y_1 = e^x$ ,

**(6Pt.)**

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**(Q<sub>5</sub>) Find the general solution of:**  $2(x-1)^2y'' + 2(x-1)y' + y = 0$ ,

**(6Pt.)**

(Q6) Solve  $\frac{d^2x}{dt^2} + \omega^2x = F_0 \cos \omega t$ ;  $x(0) = 1$ ,  $x'(0) = 1$ ,

(6Pt.)

Q1	Q2	Q3	Q4	Q5	Sum	Balance