King Saud University | **MATH 225 (Differential Equations)**

Department of Mathematics | **2nd Midterm Exam**

2nd Semester 1435-1436 H | **Duration: 90 Minutes**

Student's Name : _____ **Serial Number:**_____

Question Number	I	II	III	Total
Mark				

Question I: Choose the correct answer

(1) The following conditions make the differential equation $\frac{d^2y}{dx^2}+3\frac{dy}{dx}=0$ a boundary value problem

(a) $y(0)+2\,\frac{dy}{dx}(0)=0$

(b) $y(0)+2\,\frac{dy}{dx}(0)=0$, $y(2)+\frac{dy}{dx}(2)=1$

(c) $y(0)=1,\ \frac{dy}{dx}(0)=2$

(d) None of the previous

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(2) If $y_1, y_2, \dots, y_n$ are linearly independent solutions of the same n-th order linear differential equation, then

(a) $y_k = c_1y_1 + c_2y_2 + \cdots + c_ny_n\ ,\ for\ some\ k$

(b) $W(y_1, y_2, \dots, y_n) = 0$

(c) $W(y_1, y_2, \dots, y_n) \neq 0$

(d) None of the previous

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(3) An auxiliary equation of a 3rd order linear differential equation may have the roots

(a) $m_1 = 3, m_2 = 3+i, m_3 = 0$

(b) $m_1 = 4+3i, m_2 = 4-3i, m_3 = i$

(c) $m_1 = 2, m_2 = 2+2i, m_3 = 2-2i$

(d) None of the previous

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(4) A linear differential equation with constant coefficients having solutions $5, 6x, 2cosx, 3sinx$ is

(a) $\frac{d^4y}{dx^4}+\frac{d^2y}{dx^2}=0$

(b) $\frac{d^4y}{dx^4}+4\frac{d^2y}{dx^2}+4=0$

(c) $\frac{d^4y}{dx^4}+3\frac{d^2y}{dx^2}+4\frac{dy}{dx}=0$

(d) None of the previous

Question II: A. Find a second solution of the differential equation

$$x^2 \frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 6y = 0,$$

if $y_1(x) = x^2$ is a solution of the differential equation.

B. Find only the form of the particular solution for the differential equation by superposition approach

$$\frac{d^4y}{dx^4} - \frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} - \frac{dy}{dx} = x^2 - 5x + sinx.$$

Question III:

A. Solve the initial-value problem using the annihilator method

$$\frac{d^2y}{dx^2} + 4y = 3x + 2e^x + 5cosx, \qquad y(0) = 0, \qquad \frac{dy}{dx}(0) = 0.$$

B. Solve the following differential equation

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^{-x}lnx.$$

Good Luck ☺