King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math 202 Exam III
Semester II, 2008- (072)
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Name:	
ID:	
Serial NO:	

Q		Points
1		**16**
2		**20**
3		**20**
4		**10**
5		**10**
6		**10**
7		**10**
8		**10**
9		**24**
10		**15 (bonus)**
Total		**130**

Say a Prayer and Work Hard

(1) Solve

$$y''' + y'' = 8x^2$$

(2) Solve

$$x^2 y'' - 2y = x^3 \sin x$$

(3) Solve:

$$x^2 y'' - 4xy' + 6y = 2x^4 + x^2$$

(4) **"DO NOT SOLVE THE DE"**

Use the substitution $x = e^t$ to transform the Cauchy-Euler equation

$$x^2 y'' - 4xy' + 6y = 0$$

to a DE with constant coefficients.

(5) Given that $y_1 = x^{-1}$, $y_2 = x^4$ are solutions for the DE

$$x^2y'' - 2xy' - 4y = 0 \qquad (*)$$

and $y_p = -1$ is a particular solution for

$$x^2y'' - 2xy' - 4y = 4 \qquad (**)$$

The general solution for (**) is <u>(circle the correct answer)</u>

(a) $y = c_1x^{-1} + c_2x^4 - c_3$

(b) $y = c_1 + c_2x^{-1} + x^4$

(c) $y = c_1x^{-1} + c_2x^4 - 1$

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(6) Given that $y_{p_1} = x^3$ and $y_{p_2} = 5x^3$ are, respectively, particular solutions of $y''' + 2y = 6 + 2x^3$ and $y''' + 2y = 30 + 10x^3$.

Find particular solutions of

$$y''' + 2y = 4x^3 + 12$$

(7) Use Reduction of Order (4.2) method to find a second linearly independent solution for :

$$y'' - y = 0$$

Given that $y_1 = \cosh x$ is a solution.

(8) Find a linear differential operator that annihilates the function

$$x^3 e^{4x} \cos 3x + x^2 e^{-3x} \sin 4x$$

(9) True or False:

1) The functions $y_1(x) = 2e^{3x}$ and $y_2(x) = e^{-3x}$ form a fundamental set of solutions of the DE $y'' - 9y = 0$. ( )

2) If $y_1 = 1, y_2 = x, y_3 = e^{3x}$ then $W(y_1, y_2, y_3) = 9e^{3x}$. ( )

3) $L = (D+2)^2(D-1)^3$ is an annihilator for the function $f(x) = xe^x - e^{-2x} + x^2e^x$ ( )

4) $y = x^2$ is the only solution on any interval containing $x = -1$ for the IVP: $(x^2+1)y'' - xy' = 1$, $y(-1) = 1$, $y'(-1) = -2$. ( )

5) $x^2y'' - 2y' + 1 = 0$ is the associated homogeneous equation of $x^2y'' - 2y' + 1 = \sin x$. ( )

6) A constant multiple of a solution of a linear differential equation is also a solution. ( )

7) A set of functions is linearly independent if at least one function can be expressed as a linear combination of the remaining functions. ( )

8) The IVP : $3y'' + (x-2)y' = \dfrac{1}{x+3}$, $y(0) = 0, y'(0) = 1$ has a unique solution on the interval [0,4] . ( )

9) $y'' + y' = 0$, $y(0) = 1, y(1) = 0$ is a boundary value problem. ( )

10) $L_1L_2f = L_2L_1f$ (where $L_1 = xD - 1, L_2 = D + 1, f(x) = x$). ( )

11) $(e^{\frac{\pi}{4}i} + e^{-\frac{\pi}{4}i})^2 = 0$ ( )

12) $L = D^2 + 1$ is an annihilator for $f(x) = \sin x \cos x$ ( )

(10) BOUNUS

Solve :

$$\frac{xy''}{y'} + 1 = x^2 y'$$

Wish you a FULL MARK