KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Major Exam 2

Math 202

(Elements of Differential Equations)

Time Allowed: 1 ½ Hours

Student Name:_____ **Id. No**._____

Section:_____

Note

No programmable calculators and mobile phones allowed in the examination hall. For all questions show calculations in support of your answers.

Question No	Marks
1	**/3**
2	**/3**
3	**/3**
4	**/3**
5	**/3**
6	**/5**
Total	**/20**

Instructor Name
Ashfaque H. Bokhari

Q1 Solve the IVP $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$ such that $y(0) = 1, \quad y'(0) = 2$. Show that solutions are linearly independent for all real numbers.

Q2 ODE $x^2 \frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 3y = 0$ and **one** solution $y_1 = x$ is given.

Use ***reduction of order method*** to find the **second** solution.

Q 3 Use variation of parameter method to solve $y''+4y=\cot 2x$

Q4 Solve the **Cauchy-Euler** equation $2x^2y''+3xy'+2y=0$.

Q5. Give annihilator for each of the functions given below:

Function	**Annihilator**
$e^{5x}\cos 2x$	
$2x^2 + 3x^4$	
$x\sin x$	
$2x^5 + e^x + x\sin x + xe^{2x}\cos x$	

Q6. Given that x=0 is a regular singular point of the ODE $x^2y''+4xy'+(x^2+2)y=0$, use Frobenius method to find **(a)** indicial equation, **(b)** recursive relation, and **(c)** one solution.