

**KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS****Major Exam 1****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	/2
2	/3
3	/4
4	/3
5	/2
6	/3
7	/1
8	/2
<b>Total</b>	<b>/20</b>

Instructor Name  
Ashfaque H. Bokhari

Q 1 Solve the IVP  $3y^2 \frac{dy}{dx} = e^{x-y^3}$  subject to  $y(2) = 0$

Q2 Find one parameter family of solutions of the ODE

$$(1 + 2e^{y/x} - 2\frac{y}{x}e^{y/x})dx + 2e^{y/x}dy = 0$$

Q3. Find one parameter family of solutions of the ODE  $x^4 \frac{dy}{dx} + \frac{4}{7}yx^3 = \frac{4}{7}y^{-3/4}$

Q4 Solve the IVP  $(1 - 3xe^{3y})dy - e^{3y}dx = 0$  subject to  $y(-2) = 0$ .

Q5 The ODE  $[\cos 2(x - y) + \sin 2(x - y)]dx - [\cos 2(x - y)]dy = 0$  is **not exact**. Make it exact by:

(a) Finding an integrating factor

(b): Check that the resulting equation satisfies the condition of an exact ODE.

Q6. Find an appropriate substitution to solve the IVP  $(y^2 - xy)dx + (x^2 + xy)dy = 0$  subject to  $y(1) = 1$ .

- Q7. Determine region of the  $xy$ -plane for which  $\frac{dy}{dx} = y^{3/4}$  has a unique solution whose graph passes through some given point.

Q8. Verify that the one parameter family  $x^3 + y^3 = 3cxy$  is an implicit solution of the

$$\text{ODE } \frac{dy}{dx} = \frac{y(y^3 - 2x^3)}{x(2y^3 - x^3)}$$