

## Al-Mustaqbal University / College of Engineering & Technology (Chemical Engineering and Petroleum Industries Department) Class (3<sup>th</sup>)

### Subject (Corrosion Engineering) / Code (MATH221) Lecturer (1)

 $\mathbf{1}^{\text{st}}/\mathbf{2}^{\text{nd}} \text{ term -- Lecture No. \& Lecture Name (Partial differential Equation)}$ 

| Partial Differential Equations (PDEs).   |
|--|
| In problems where one variable, say u, depends   |
| on more than one independent variable, say that  |
| Xand to then any doc valives of youll be   |
| (partial derivatives) such as ou or ozu and any  |
| (partial derivatives) such as ou or or and any differential equation arising will be known as a partial differential equation.   |
| a partial differential equation.   |
|  |
| 1) * Method of Direct Integration.   |
|  |
| Ex(1) Solve; $\frac{\partial^2 u}{\partial x^2} = x^2 + y$<br>Sol<br>O Integrate with respect to(X)  |
|  |
| 501  |
| @ Integrate with respect to(X)   |
|  |
| $\int \frac{\partial^2 u}{\partial x^2} = \int x^2 + y  dx$  |
| ) 0 X -  |
| 24 = x3 + yx + f(y)  |
| -0 X 3   |
| ② Integrate with respect to (x)  |
|  |
| $\int \frac{\partial x}{\partial x} = \int \frac{x^3}{3} + y + f(y) dx$  |
| <del></del>  |
| $\frac{1}{12} + \frac{1}{12} + \frac{1}{2} + $ |
| 12 2 3, 33   |



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1<sup>st</sup>/2<sup>nd</sup> term – Lecture No. & Lecture Name (Partial differential Equation)

| Example (2) Solve $\frac{\partial^2 Z}{\partial x \partial y} = \chi^2 y$ that Subject   |
|--|
| to the conditions $Z(x_{10}) = x^2 \& Z(1,y) = \cos y$   |
| L Integrate with respect to X.   |
| 37 - (X2 y dx > 32 - 1 xy + f(y)   |
| 2-Integrate with respect to y $Z = \int \frac{1}{3} x^3 y + f(y) dy$   |
|  |
| $\frac{1}{6} \times \frac{1}{6} \times \frac{3}{9} \times \frac{2}{1} + F(y) + g(x)$ $\frac{1}{6} \times \frac{3}{9} \times \frac{2}{1} + F(y) + g(x) = x^2$ |
| ①Boundry condition $Z(X/0) = X^2$<br>$Z = X^2$ $y = 0$   |
| $\Rightarrow X^{2} = \frac{1}{6} X^{3} (0)^{2} + F(0) + 9(X)$  |
| $X^{2} = F(0) + g(x) = x^{2} - F(0) = Sub.;$   |
| $Z = \frac{1}{6} x^3 y^2 + F(y) + x^2 - F(0)$ 2  |
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| 5v 1 3 <sup>3</sup> -7   |
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| Example (4) Salve 37 - 18xy2 + 5in (2x-)   |
|  |
| Sol: Integrate wr. to x  |
| $\frac{\partial^2 Z}{\partial x \partial y} = \frac{18 \times ^2 y^2}{2}  \frac{\cos(2x-y)}{2} + f(y)$ $\frac{1}{2} = \frac{18 \times ^2 y^2}{2}  \frac{\cos(2x-y)}{2} + f(y)$ $\frac{1}{2} = \frac{18 \times ^2 y^2}{2}  \frac{\cos(2x-y)}{2} + \frac{\cos(2x-y)}$ |
| 2 2 2  |
| Integrate w x to X   |
|  |
| $\frac{\partial Z}{\partial y} = \frac{9}{3} \frac{x^3}{y^2} \frac{1}{2} \frac{\sin(2x-y)}{2} + F(y)$  |
| Dy 3 0 2 2   |
|  |
| Integrate w. K. to 4   |
| J (())   |
| Integrate w.k.to y $ \frac{7-3x^3y^3/1[-\cos(2x-y)]}{3y^3-1}+F(y)+g(x) $   |
| 3 3  |
| = Z = x3y3 1 Cos (2x -y) + F(y) + 9(x)   |
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