

**Q1: Complete the following table;** (2marks)

DE.	independent	dependent	order	linear/non linear
$y \frac{d^6 y}{dx^6} - 5x^2 \frac{d^3 y}{dx^3} + 5 = 0$				
$6 \frac{dx}{dt} = t(25 - t^2)$				

**Q2: Mark True or false and Justify your answer:** (3 marks)

(1). The differential equation  $\frac{dy}{dx} = \frac{e^{x+y}}{y-1}$  is a separable first order differential. ( )

(2)  $(e^{2y} - y \cos xy)dx + (2xe^{2y} - x \cos xy + 2y)dy = 0$  is an Exact equation. ( )

(3) The integrating factor for the differential equation ;  
 $(x+2)^2 \frac{dy}{dx} = 8 - 8y - 4xy$  is  $(x+2)^2$  ( )

**(Q3) a)** Determine whether the initial value problem  $(4 - y^2) y' = x^2$  ;  $y(0) = 3$   
 has unique solution by the existence and uniqueness theorem. (3marks)

b) Determine whether the relation  $x + y + e^{xy} = 0$  is an implicit solution of ODE:  
 $(1 + xe^{xy}) \frac{dy}{dx} + 1 + ye^{xy} = 0$  (3marks)

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**Q4::Solve the equations;**

a)  $\frac{dy}{dx} = \frac{y^2 + x\sqrt{x^2 + y^2}}{xy}$  (homogeneous equation) (4marks)

b)  $(\cos x \sin x - xy^2)dx + y(1 - x^2)dy = 0$  ;  $y(0) = 2$  (4marks)

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c)  $(x + 2y - 1)dx + 3(x + 2y)dy = 0$  (4marks)

**Q5):** Given  $u(x) = \frac{2}{x}$  is a solution to  $\frac{dy}{dx} = -\frac{4}{x^2} - \frac{1}{x}y + y^2$

Find the other solution. (4marks)