



**Answer the following questions**

**Question 1 ( 30 MARKS)**

(A) Check if the given pair of functions are linearly dependent or not

- (i)  $f(t) = e^t$  and  $g(t) = e^{-t}$
- (ii)  $f(t) = \sin t$  and  $g(t) = \cos t$
- (iii)  $f(t) = t + 1$  and  $g(t) = 4t + 4$
- (iv)  $f(t) = 2t$  and  $g(t) = t + 1$

(15 Marks)

(B) If  $y_1$  and  $y_2$  are two solutions of the equation  $ty'' + 2y' + te^t y = 0$  and  $w(y_1, y_2)(1) = 2$  Find  $w(y_1, y_2)(5)$

$$\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial y} \frac{\partial u}{\partial x} - 2 \frac{\partial^2 u}{\partial y^2} = e^x (y - 1)$$

(15 Marks)

**Question 2 ( 40 MARKS)**

(A) Find the complete general solution and the singular solution of the following non-linear partial differential equation

$$\frac{\partial u}{\partial x} \frac{\partial u}{\partial y} = 2xy$$

(15 Marks)

(B) For the following partial differential equation

$$x^2 \frac{\partial z}{\partial x} + y^2 \frac{\partial z}{\partial y} + z^2 = 0$$

Find (i) The general solution of the PDE.

- (ii) The particular solution which passes through the curve  $xy = x + y, z = 1$
- (iii) The equation of the required integral surface.

(25 Marks)

**Question 3 ( 30 MARKS)**

(A) For the total differential equation in three variables,

Solve the following equation  $yz dx + (xz - yz^3) dy - 2xy dz = 0$  (15 Marks)

(B) For the total differential equation in three variables,

Solve the following equation  $yz dx - z^2 dy - xy dz = 0$ ,  
 using the method of substitution and also by the integrating factor. (15 Marks)

This exam measures the following ILOs

Question Number	Q1-a	Q2-a			Q2-b	Q3-b			Q1-b	Q3-a	
Skills		b-i			b-i, b-iii						
	Knowledge & understanding skills				Intellectual Skills				Professional Skills		

*With my best wishes*

*Associate Prof. Dr. Islam M. Eldesoky*