



Answer the following questions

Question 1 (30 MARKS)

(A) Find the general solution of the following partial differential equation (wave

$$\text{equation) } \frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 u}{\partial t^2} + 8(x^2 + t^2) = 0 \quad (15 \text{ Marks})$$

(B) Find the general solution of the following partial differential equation

$$\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial y} \frac{\partial u}{\partial x} - 2 \frac{\partial^2 u}{\partial y^2} = e^x (y - 1) \quad (15 \text{ Marks})$$

Question 2 (40 MARKS)

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

$$\frac{\partial u}{\partial x} \frac{\partial u}{\partial y} = 2xy \quad (15 \text{ Marks})$$

(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,

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

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

$$\text{Solve the following equation } yz dx - z^2 dy - xy dz = 0,$$

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

Dr. Islam M. Eldesoky