**National University of Computer & Emerging Sciences, Karachi**
**Spring-2021 CS-Department**
**Class Test**

**March 10th, 2021 (09:00-10:30) PM**

| **Course Code: MT 224** | **Course Name: Differential Equations** |
|---|---|
| **Instructor Name: Ms. Asma Masood** | |
| **Student Roll No:** | **Section No:** |

Instructions:

- All the answers must be solved according to the sequence given in the question paper.
- Convert the answer sheet into PDF and upload on GCR before time.
- No submission after due time is acceptable.

**Time**: 90 minutes. **Total weightage: 05**

**Question: 01** **[Weightage: 0.5 Marks: 12]**

In each part determine whether the equation is linear in x and y. If nonlinear explain why. Also give the order and degree of the differential equation.

a) $\frac{dy}{dx} + ycosx = sinx$

b) $\frac{d^2y}{dx^2} + xy(\frac{dy}{dx})^2 = 0$

c) $\left(1 + (\frac{dy}{dx})^2\right)^{\frac{1}{2}} = \frac{d^2y}{dx^2}$

d) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^x$

**Question: 02** **[Weightage: 1.5 Marks: 10]**

State true or false. If false give reason why

a) A differential equation is considered to be ordinary if it has more than one independent variable.

b) Elimination of constants $C_1$ and $C_2$ from the equation $y = C_1 e^{3x} + C_2 e^{3x}$ gives a differential equation of order 3.

c) The differential equation $\left(\frac{\partial u}{\partial x}\right)^5 + \left(\frac{\partial^2 u}{\partial y^2}\right)^3 = \frac{\partial u}{\partial z}$ has the order and degree, 1 and 5 respectively.

d) $e^x \frac{dy}{dx} + 3y = x^2 y$ is linear in $x$.

e) $t\,dx - (x + t^2 - 2x\sqrt{t})dt = 0$ is a variable separable and linear DE.

f) $y = 1 - x^2$ is a solution to the differential equation $y'' - xy + y = 0$.

g) $y' = \frac{xy^2}{x^2y + y^3}$ is a Bernoulli DE.

h) $(2x^2t - 2x^3)dt + (4x^3 - 6x^2t + 2xt^2)dx = 0$ is an exact DE.

i) The IF $(y+1)dx - xdy = 0$ is given by $\frac{-1}{x^2}$.

j) The value of $m$ will be 2 for which $y = e^{mx}$ will be a solution of $y'' - 5y' + 6y = 0$

**Question: 03** **[Weightage: 03 Marks: 20]**

Solve the following differential equations

(a) $y' = \frac{y+x}{x}$.

(b) $y' = \frac{2y^4 + x^4}{xy^3}$.

(c) $y' = \frac{2xye^{(x/y)^2}}{y^2 + y^2e^{(x/y)^2} + 2x^2e^{(x/y)^2}}$.

(d) $y' = \frac{3yx^2}{x^3 + 2y^4}$.

**GOOD LUCK**