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# Daffodil International University

**Faculty of Science & Information Technology**
**Department of Computer Science and Engineering**
**Midterm Examination, Fall 2026**
**Course Code: MAT211, Course Title: Engineering Mathematics**
**Level: L2 Term: T1 Batch: 70**

**Time: 01:30 Hrs** **Marks: 25**

## Answer ALL Questions

***[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]***

| | | | | |
|---|---|---|---|---|
| **1.** | ***a.*** | Demonstrate the general form of Homogeneous differential equation and Bernoulli's equation with example. | **[2]** | **CO1** |
| | ***b.*** | Demonstrate the ordinary differential equation of a family of curves $y = A + Blnx + C(lnx)^2 + 4x^3$ | **[4]** | |
| **2.** | ***a.*** | Due to a brief power fluctuation, the cooling system in a data center room shuts down. According to Newton's Law of Cooling/Warming, the rate of change of the server room's temperature T(t) is proportional to the difference between the ambient outside temperature(Ta) and the current room temperature. The system is modeled by the differential equation: $\frac{dT}{dt} = -k(T - Ta)$ Where $Ta = 35°C$ (ambient outdoor temperature on a hot day), $k = 0.1$ per minute (thermal heat transfer coefficient of the room), $T(0) = 20°C$ (initial cooled room temperature). Identify the room temperature after 10 minutes of cooling failure. | **[4]** | **CO2** |
| | ***b.*** | Solve the first order first degree Ordinary Differential Equation(ODE) $x\frac{dy}{dx} - y = \sqrt{x^2 + y^2}$ | **[4]** | |
| | ***c.*** | Solve the non-linear ODE $(y^2x^3 + xy)dx = dy$ by converting it into linear differential equation. | **[5]** | |
| **3.** | | Solve the higher order ODE $D^3y - D^2y - 4y = e^{-x} + cos2x$ | **[6]** | **CO2** |

$e^{x}$

$c_1 e^{m_1 x}$