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# Daffodil International University

**Faculty of Science & Information Technology**
**Department of Computer Science and Engineering**
**Mid Examination, Summer 2025**
**Course Code: MAT211, Course Title: Engineering Mathematics**
**Level: L1 Term: T3 Batch: 67**

**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) | **Explain** the order and degree of the ODE: $x^5\frac{d^3y}{dx^3}+2y\left(\frac{d^4y}{dx^4}\right)^{-5}=x^2\frac{d^4y}{dx^4}$. | [2] | CO1 |
| | b) | **Outline** an ODE corresponding to the following function: $y=Pe^{2x}+Qe^{-2x}+R\sin 2x+S\cos 2x.$ | [4] | |
| | c) | **Interpret** the solution to the following ODE: $\frac{dy}{dx}=e^{2x+2y}$. | [4] | |
| 2. | a) | **Solve** the following Bernoulli's ODE: $\frac{dy}{dx}+3y=e^{2x}y^{-4}$. | [5] | CO2 |
| | b) | The packet loss rate $L(t)$ due to buffer overflow can be modeled as: $\frac{dL}{dt}=\gamma(B-L)$ where $B$ = buffer capacity (1000 packets), $\gamma$ = rate of loss increase (0.05 per second), initial loss rate $L(0)=50$. **Solve** for the loss rate after 10 seconds. | [5] | |
| 3. | | **Solve** the following higher order ordinary differential equation (ODE) with constant coefficients $\frac{d^3y}{dx^3}-2\frac{d^2y}{dx^2}-4\frac{dy}{dx}+8y=f(x)$ where $f(x)=e^{-x}\cos 2x.$ | [5] | CO2 |