Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Mid-Term Examination, Semester: Fall, 2017

Course Code: MAT131 **Course Title:** Ordinary and Partial Differential Equations

Sections: All **Course Teachers:** All

Time: 1.5 Hours **Total Marks:** 25

Note: (i) Answer all the questions from Part-A and any FIVE (05) questions from Part-B; (ii) Write only the correct options for question no. 1 in your answer script; (iii) Figures in the right margin indicate full marks;

Part-A

1. a) Which one is separable equation? [1]

i. $\frac{dy}{dx} = 1 + e^{x+y}$

ii. $\frac{dy}{dx} = \frac{x+1}{y-1}$

iii. $\frac{dy}{dx} - y = x$

iv. $\frac{dy}{dx} = 2x - y$

b) Which one is Bernouli equation? [1]

i. $\frac{dy}{dx} + 2xy = \sqrt{y}$

ii. $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$

iii. $\frac{dy}{dx} - \frac{y}{x} = x$

iv. $\frac{dy}{dx} - y\cot x = 0$

c) If e^x is the integrating factor of $\frac{dy}{dx} + P.y = Q$, then $P = ?$ [1]

i. $\ln x$

ii. x

iii. $1/x$

iv. 1

d) Which of the followings is not a homogeneous differential equation? [1]

i. $\frac{dy}{dx} = \frac{x-y}{2y}$

ii. $\frac{dy}{dx} = x^2 - y^2$

iii. $\frac{dy}{dx} = \frac{x-y}{x+y}$

iv. $\frac{dy}{dx} = \frac{x}{y}$

e) Identify the order and degree of the differential equation $\sqrt{\frac{dy}{dx}} + xy = 0$. [1]

i. order 1, degree $1/2$

ii. order 1, degree 1

iii. order 2, degree 1

iv. order $1/2$, degree 2

Part-B

2. Solve the following differential equation by separating the variables: [4]

$$\frac{dy}{dx} = \frac{xy + 2y - x - 2}{xy - 3y + x - 3}$$

3. Solve the following differential equation by using an appropriate substitution: [4]

$$\frac{dy}{dx} = \tan^2(x + y).$$

4. Solve the following homogeneous differential equation: [4]

$$x\frac{dy}{dx} = y + \sqrt{x^2 - y^2}.$$

5. Solve the following first-order linear differential equation: [4]

$$(x+1)\frac{dy}{dx} + (x+2)y = 2xe^{-x}$$

6. Transform the following Bernoulli equation to a linear differential equation: [4]

$$\frac{dy}{dx} = y(xy^3 - 1).$$

7. Check whether the following differential equation is exact or not, then solve: [4]

$$(\sin y - y\sin x)dx + (\cos x + x\cos y - y)dy = 0.$$