

CONCORDIA UNIVERSITY
FACULTY OF ENGINEERING AND COMPUTER SCIENCE
APPLIED ORDINARY DIFFERENTIAL EQUATIONS - ENGR 213/2 sect. T, FALL 2013

Section T

Instructor: Dr. Rama Bhat

Date of Mid Term Test: Monday, October 7, 2013

Time: 1:15 – 2:45 PM

This is a closed book exam. Solve all questions. All the questions carry equal marks.

Only faculty approved calculators are allowed.

PROBLEM No. 1.

- (a) Verify that $y(x) = e^{3x} \cos 2x$ is an explicit solution of $y'' - 6y' + 13y = 0$.
(b) Write the solution in the implicit form.

PROBLEM No. 2. Given the differential equation: $\frac{dy}{dx} + \left(\frac{xy + y^2}{x^2} \right) = 0$

- (a) Convert the equation to the form $M(x,y)dx + N(x,y)dy$, and show that the equation is not variable separable.
(b) Show that functions $M(x,y)$ and $N(x,y)$ are homogeneous.
(c) Using an appropriate substitution, say, $y=ux$, convert the equation to variable separable form.
(d) Solve the equation to obtain $y(x)$.

PROBLEM No. 3. Given the following differential equation

$$\frac{dy}{dx} + \frac{2xy}{x^2 - 1} = 0$$

- (a) Convert the equation to $M(x,y)dx + N(x,y)dy = 0$ form and show that it is an exact equation.
(b) Solve using the method of exact differentials.

PROBLEM No. 4. Using integrating factor, solve the following differential equation

$$x \frac{dy}{dx} - 4y = x^6 e^x$$

PROBLEM No. 5.

- (a) Write the complex expression in the $a+ib$ form.

$$\frac{(4 + 5i) + 2i^3}{(2 + i)^2}$$

- (b) Write the result above in (a) in the polar form.