KFUPM, DEPARTMENT OF MATHEMATICS AND STATISTICS

MATH 202 : TEST 1, SEMESTER (151), MARCH 14, 2015

Name : ....

ID : .....

Exercise	**Points**
1	: **9**
2	: **10**
3	: **8**
4	: **12**
5	: **13**
Total	: **52**

Exercise 1.

(a) Find the order of the given DE. Determine whether the DE is linear or non-linear.

(i)

$$x[y^{(4)}]^6 - y^{(5)} + y^{20} = \cos(x).$$

(ii)

$$(\cos x)y'' - x - y' = e^x.$$

(b) Find all values of m so that the function $y = e^{mx}$ is a solution of the DE :

$$y''' - 6y'' + 11y' - 6y = 0.$$

Exercise 2. Consider the DE :

$$y' = \frac{1}{2}x(1-y^2)$$

(*a*) Verify that $y = \dfrac{1+ce^{-(x^2/2)}}{1-ce^{-(x^2/2)}}$ is a one-parameter family of solutions of the DE.

(*b*) Find all constant solutions of the DE.

(*c*) Find a singular solution of the DE.

Exercise 3. Does the IVP

$$(y^{'} = \sqrt{y^2 - 4} - \frac{1}{x}, \;\; y(1) = 7)$$

has a unique solution on an appropriate open interval containing 1 ?

What is the largest interval on which the solution may be defined ?.

Exercise 4. Solve the IVP

$$(xe^{x^2+\sin y}\,\mathrm{d}x + \cos y\,\mathrm{d}y = 0, \quad y(0) = \pi)$$

What is the largest interval on which the solution may be defined ?.

Exercise 5. Solve the DE

$$(x^2 - 4)y' + y = \left(\frac{2-x}{x+2}\right)^{3/4}$$

on the interval $I = (-2, 2)$.