Prince Sultan University

Department of Mathematics and General Sciences

Math 225

Final Examination

Term 141

Wednesday, January 14, 2015

Time Allowed: 120 minutes

Name:

Student Number:

Statement of Ethics:

I agree to complete this exam without unauthorized assistance from any person, materials, or device.

Signature:

Question's Number	1	2	3	4	5	6	**Total**
Question's Points	14	12	14	12	13	15	**80**
Student's Points							

Total/40:

Question.1

a) Find the value of c for which the equation $(xy^2 + cx^2 y) + (2x + y)x^2 y' = 0$ is exact.

b) Solve the equation using the value of c you find in part (a).

Question.2 Find the solution of the initial value problem $2x^2 y'' + xy' - 3y = 0,\ y(1) = 1,\ y'(1) = 2$.

Question.3

a) Find the solution of the homogeneous equation $y^{(4)} + 4y'' = 0.$

b) Determine a suitable form for the particular solution y_p of

$$y^{(4)} + 4y'' = \sin 2t + te^t + 6$$

if the method of undetermined coefficients is to be used. **Do not attempt to evaluate the constants.**

Question.4

a) Find all singular points and determine interval of convergence for the solution of $x(3-x)y'' + (x+1)y' - 4y = 0$.

b) Determine whether each singular point is regular or irregular

Question.5

a) Find the inverse Laplace transform of $F(s) = \dfrac{3s+3}{s^2+2s+5}$.

b) Express the solution of the initial value problem $y'' + 4y' + 4y = g(t), \quad y(0) = 1, \quad y'(0) = -2$ in terms of a convolution integral.

c) Let $g(t) = e^{-2t}$. Write the solution you obtained in part (b) in explicit form.

Question.6

a) Find the solution of the homogeneous system $\vec{x}' = \begin{pmatrix} 2 & 3 \\ -1 & -2 \end{pmatrix}\vec{x}$.

b) Find the general solution of the system $\vec{x}' = \begin{pmatrix} 2 & 3 \\ -1 & -2 \end{pmatrix}\vec{x} + \begin{pmatrix} e^t \\ -e^t \end{pmatrix}$.