

**Lovely Professional University, Phagwara, India**

**Engineering Mathematics (MTH174)**

**Tutorial sheet - 5**

1. Using operator method, find the general solution of the differential equations:

(a)  $y'' + 5y' + 4y = 18e^{2x}$

(h)  $(2D^2 - 7D + 3)y = \sin(x)$

(b)  $y'' - 3y' - 4y = e^x + 6e^{5x}$

(i)  $(D^2 + 3)y = \cos(\sqrt{3}x)$

(c)  $y'' + y' - 6y = e^{2x}$

(j)  $(D^2 + 25)y = 9x^3 + 4x^2$

(d)  $y'' - 2y' + y = e^x + 4e^{2x}$

(k)  $(D^3 - D^2 + 9D - 9)y = 30 \cos(3x)$

(e)  $(D^2 - 1)y = 6xe^x$

(l)  $(4D^3 - 12D^2 + 13D - 10)y = 16e^{(x/2)} \cos(x)$

(f)  $(2D^2 + 7D - 4)y = xe^{-4x}$

(g)  $(D^2 + 16)y = \cos(2x)$

2. Find the general solution of the following differential equations.

(a)  $x^2y'' + xy' - 4y = 0$

(d)  $x^4y^{iv} + 3x^3y''' = 0$

(b)  $9x^2y'' + 3xy' + 10y = 0$

(e)  $x^2y'' + 2xy' - 2y = 6x - 14$

(c)  $x^3y''' + xy' - y = 0$

(f)  $x^2y'' + 5xy' - 5y = 24x \ln(x)$

3. Using method of undetermined coefficients, write the form of the particular solution of following differential equations

(a)  $y'' - 3y' - 10y = 1 + x^2$

(d)  $y'' + 3y' + 12y = \cos(x) + \sin(x)$

(b)  $y'' + 4y' + 4y = e^x + e^{3x} + 12e^{-2x}$

(e)  $y'' + 16y = 16 \sin(4x)$

(c)  $y'' + 6y' + 8y = e^{-3x} + e^x$

(f)  $y''' - y'' + y' - y = 6 \cos(2x)$

4. Using variation of parameter, find the solution of following differential equations

(a)  $y'' + y = \operatorname{cosec}(x)$

(b)  $y'' + 16y = 32 \sec(2x)$

(c)  $y'' + 6y' + 9y = \frac{e^{-3x}}{x}$