4.1 Preliminary

Student's Name: ———————— Student ID: ————————-

Marks:

Mark True or False with justifications your answer

(1) The set y_1 and y_2 are linearly independent if and only if the wronskian (W) is zero[ ]

(2) The functions $\{e^x \cos(2x),\ e^x \sin(2x)\}$ form a fundamental set of solutions of the DE $y'' - 2y' + 5y = 0$ [ ]

(3) In the interval $(-\infty, \infty)$ the two functions $f_1(x) = x + 2$ and $f_2(x) = |x| + 2$ are linearly dependant [ ]

(4) If the functions $y_{p1} = e^{2x}$ and $y_{p2} = xe^x$ are a particular solution of the DE $y'' - 3y' + 4y = 2e^{2x}$ and $y'' - 3y' + 4y = 2xe^x - e^x$, respectively. Then the Particular solution of The DE $y'' - 3y' + 4y = 2e^{2x} + 2xe^x - e^x$ is $y_p = e^{2x} + e^x$ [ ]

4.3 Homogenous linear equation with constant coefficients

Student's Name: ———————— Student ID: ————————-

Marks: ———

Find the general solution of:

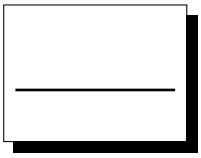
$$(D^5 - 16D^3)y = 0$$

Solve the given IVP:

$$y^{(4)} + 3y^{(3)} + 2y'' = 0, \;\; y(0) = 0, = y'(0) = 4, y''(0) = -6, y'''(0) = 14$$

4.4 Undetermined coefficients

Student's Name: ———————— Student ID: ————————-

Marks: 

Solve the given IVP by undetermined coefficients:

$$y'' + 3y' = 18x, \;\; y(0) = 0, = y'(0) = 5$$

Solve the given BVP by undetermined coefficients:

$$y'' + 2y' + y = x, \;\; y(0) = -2, = y'(1) = 2$$

4.5 Undetermined coefficients- annihilator approach

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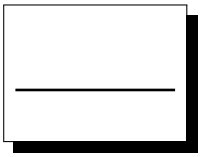
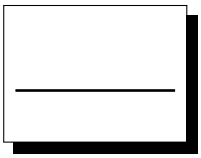
Marks: 

Solve the given IVP by undetermined coefficients (annihilator approach):

$$y''' - 2y'' + y' = xe^x + 4, \;\; y(0) = 1 = y'(0)$$

4.6 Variation of parameters

Student's Name: ———————— Student ID: ————————-

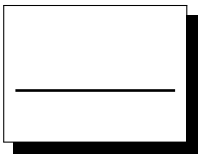
Marks: 

Solve the DE by variation of parameters:

$$y'' + y = \tan^2 x$$

4.7 Cauchy-Euler equation

Student's Name: ———————— Student ID: ————————-

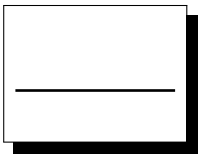
Marks: 

Find the general solution of:

$$x^2y'' - 4xy' + 6y = 2x^4 + x^2$$

4.8 Solving system of DEs. by elimination

Student's Name: ———————— Student ID: ————————-



Marks:

Use systematic elimination to solve the given system of differential equations:

$$\begin{aligned}(D+2)x + (D+1)y &= \sin(2t)\\ 5x + (D+3)y &= \cos(2t)\end{aligned}$$