Key

Birzeit University
Mathematics Department
Math331
Quiz 6

Instructor: Dr. Ala Talahmeh
Name:.....
Section: (1)

First Semester 2019/2020
Number:.....
Date: 18/11/2019

Question I [4 points]. Find the form of y_p for the following DE.

$$y^{(5)} + 4y''' = 8\sin 2t.$$

Question II [6 points]. Given that $y_1 = te^{5t}$ is a solution of

$$y^{(4)} - 12y''' + 47y'' - 70y' + 50y = 0.$$

Find the general solution of the given differential equation.

Q I. y_h: $r^5 + 4r^3 = 0 \Rightarrow r^3(r^2+4) = 0$

$\Rightarrow r = 0, 0, 0, \pm 2i$

$y_h = c_1 + c_2 t + c_3 t^2 + c_4 \cos 2t + c_5 \sin 2t$

the form of y_p is $y_p = (A\cos 2t + B\sin 2t)\cdot t$

Q II. the aux. eq. is $r^4 - 12r^3 + 47r^2 - 70r + 50 = 0$

Given that $(r-5)^2 = r^2 - 10r + 25$ is a factor

$$\begin{array}{r|l} & r^2 - 2r + 2 \\ \hline r^2 - 10r + 25 & r^4 - 12r^3 + 47r^2 - 70r + 50 \\ & -r^4 \pm 10r^3 \mp 25r^2 \\ \hline & -2r^3 + 22r^2 - 70r + 50 \\ & \pm 2r^3 \mp 20r^2 \pm 50r \\ \hline & 2r^2 - 20r + 50 \\ & \pm 2r^2 \mp 20r + 50 \\ \hline & 0 \end{array}$$

Good Luck

$$\Rightarrow (r-5)^2(r^2-2r+2)=0$$

$$\Rightarrow r = 5, 5, \frac{2 \pm \sqrt{4-4(1)(2)}}{2}$$

$$= 5, 5, 1 \pm i$$

$$\therefore y_h = c_1 e^{5t} + c_2 t e^{5t} + c_3 e^t \cos t + c_4 e^t \sin t .$$

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Instructor: Dr. Ala Talahmeh
Name:.....
Section: (5)

First Semester 2019/2020
Number:.....
Date: 19/11/2019

Question I [4 points]. Find the **form** of y_p for the following DE.

$$y''' + y'' = e^t \cos t.$$

Question II [6 points]. Solve the following homogeneous differential equation

$$4y''' + y' + 5y = 0.$$

Q I. y_h: $r^3 + r^2 = 0 \Rightarrow r = 0, 0, -1$

$y_h = c_1 + c_2 t + c_3 e^{-t}$.

the form of y_p is $y_p = A e^t \cos t + B e^t \sin t$.

Q II. the aux. eq. is $4r^3 + r + 5 = 0$

$4(-1)^3 + -1 + 5 = -4 - 1 + 5 = 0$

$\Rightarrow (r+1)$ is a factor

$$\begin{array}{r|l} & 4r^2 - 4r + 5 \\ \hline r+1 & 4r^3 + r + 5 \\ & -4r^3 + 4r^2 \\ \hline & -4r^2 + r + 5 \\ & \pm 4r^2 \mp 4r \\ \hline & 5r + 5 \\ & -5r + 5 \\ \hline & 0 \end{array}$$

$\therefore (r+1)(4r^2 - 4r + 5) = 0$

$\Rightarrow r + 1 = 0, \quad r = \dfrac{4 \pm \sqrt{16 - 4(4)(5)}}{8}$

$\Rightarrow r = -1, \frac{1}{2} \pm i$

Good Luck

$y_h = c_1 e^{-t} + c_2 e^{\frac{1}{2}t} \cos t + c_3 e^{\frac{1}{2}t} \sin t$