

NAME: ELENDU CHIDERA ISABELLA

DEPT: COMPUTER ENG

MATRIC NO: 15/ENG02/021

ASSIGNMENT 2

$$1) \frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 6\sin\theta$$

Solution

$$y'' + 4y' + 5y = 6\sin\theta$$

$$m^2 + 4m + 5 = 0$$

using quadratic formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$\Rightarrow \frac{-4 \pm \sqrt{(4)^2 - 4(1)(5)}}{2(1)}$$

$$\Rightarrow \frac{-4 \pm \sqrt{16 - 20}}{2} \Rightarrow \frac{-4 \pm \sqrt{-4}}{2}$$

$$\Rightarrow \frac{-4 \pm j\sqrt{4}}{2} \Rightarrow \frac{-4 \pm j2}{2}$$

$$m \Rightarrow -2 \pm j$$

$$y = e^{m\theta} [A + B\theta] \quad y = e^{-2\theta} [A\cos\theta + B\sin\theta]$$

$$= e^{-2\theta} [A + B\theta] \quad y = e^{-2\theta} [A\cos\theta + B\sin\theta]$$

$$P.I = \frac{1}{6} F(x) = 6\sin\theta$$

$$P.I = y = C\cos\theta + D\sin\theta$$

$$\frac{dy}{dx} = -C\sin\theta + D\cos\theta$$

$$\frac{d^2y}{dx^2} = -C\cos\theta - D\sin\theta$$

Substituting

$$\Rightarrow [C\cos\theta - D\sin\theta] + 4[-C\sin\theta + D\cos\theta] + 5[C\cos\theta + D\sin\theta] = 6\sin\theta$$

$$\Rightarrow -C\cos\theta - D\sin\theta - 4C\sin\theta + 4D\cos\theta + 5C\cos\theta + 5D\sin\theta = 6\sin\theta$$

$$\Rightarrow \cos\theta[-C + 4D + 5C] + \sin\theta[-D - 4C + 5D] = 6\sin\theta$$

$$\Rightarrow \cos\theta[4D + 4C] + \sin\theta[4D - 4C] = 6\sin\theta$$

$$\Rightarrow 4D + 4C = 0 \quad \text{--- (1)}$$

$$4D - 4C = 6 \quad \text{--- (2)}$$

$$4D + 4C = 0$$

$$4C = -4D$$

$$C = -D \quad (3)$$

$$4D - 4C = 6$$

$$4D - 4(-D) = 6$$

$$4D + 4D = 6$$

$$8D = 6$$

$$D = \frac{6}{8} \quad (4)$$

Substituting Back to equ (3)

$$4D + 4C = 0$$

$$4\left(\frac{6}{8}\right) + 4C = 0$$

$$4\left(\frac{3}{4}\right) + 4C = 0$$

$$3 + 4C = 0$$

$$4C = -3$$

$$C = -\frac{3}{4}$$

$$P \cdot I = y = -\frac{3}{4} \cos \theta + \frac{3}{4} \sin \theta$$

$$G \cdot S = C \cdot F + P \cdot I$$

$$y = e^{-2\theta} [A \cos \theta + B \sin \theta] + [-\frac{3}{4} \cos \theta + \frac{3}{4} \sin \theta]$$

$$\frac{dy}{d\theta} = e^{-2\theta}$$

$$\therefore y = e^{-2\theta} [A \cos \theta + B \sin \theta] - \frac{3}{4} [\cos \theta - \sin \theta]$$

$$\frac{dy}{d\theta} = e^{-2\theta}$$

1) Obtaining an expression for y as a function of θ

$$y = e^{-2\theta} [A \cos \theta + B \sin \theta] - \frac{3}{4} [\cos \theta - \sin \theta]$$

2) Neglecting the complementary function of the general solution

$$G \cdot S = P \cdot I$$

$$y = -\frac{3}{4} [\cos \theta - \sin \theta]$$

$$2) \quad EI \frac{d^2y}{dx^2} = \frac{\omega}{2} (L-x)^2 \quad \text{where } EI, \omega \text{ and } L \text{ are constants}$$

Solution

$$EI m^2 = 0$$

$$m^2 = 0$$

$$EI$$

$$m^2 = 0$$

$$m = \pm 0$$

$$y = e^{mx} [A + Bx]$$

$$f(x) = \frac{\omega}{2} (L-x)^2$$

$$P.I = y = Ax^2 + Bx^3 + Cx^4$$

$$\frac{dy}{dx} = 2Ax + 3Bx^2 + 4Cx^3$$

$$\frac{d^2y}{dx^2} = 2A + 6Bx + 12Cx^2$$

Substitutions;

$$EI [2A + 6Bx + 12Cx^2] = \frac{\omega}{2} (L-x)^2$$

$$2AEI + 6Bx EI + 12Cx^2 EI = \frac{\omega}{2} (L-x)^2$$

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|----|---|----|---------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|----|----|
| 1 | y | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | 1 | 0.2259 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | 2 | 0.9941 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | 3 | 0.8483 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | 4 | -0.0771 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | 5 | -0.532 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | 6 | -0.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | 7 | -0.073 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | 8 | 0.8511 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | 9 | 0.9524 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | 10 | 0.223 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | | 11 | -0.753 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | | 12 | -1.035 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | | 13 | -0.365 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | 14 | 0.6404 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | | 15 | 1.0515 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | | 16 | 0.5023 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | 17 | -0.515 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | 18 | -1.058 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | 19 | -0.629 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | | 20 | 0.3788 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | 21 | 1.0383 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | 22 | 0.7433 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | | 23 | -0.235 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | | 24 | -0.397 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | | 25 | -0.843 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | | 26 | 0.0867 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | | 27 | 0.3364 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | | 28 | 0.9251 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | | 29 | 0.0633 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | | 30 | -0.857 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | | 31 | -0.989 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 33 | | 32 | -0.212 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34 | | 33 | 0.7599 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35 | | 34 | 1.0332 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 | | 35 | 0.3656 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | | 36 | 0.648 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Chart1 Sheet1

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| 38 | | 37 | -1.057 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 39 | | 38 | -0.494 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | | 39 | 0.5229 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 41 | | 40 | 1.059 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 42 | | 41 | 0.6215 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43 | | 42 | -0.387 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 44 | | 43 | -1.04 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | | 44 | -0.737 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 46 | | 45 | 0.2442 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | | 46 | 1.0005 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | | 47 | 0.9369 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 49 | | 48 | -0.096 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | | 49 | -0.941 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | | 50 | -0.321 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 52 | | 51 | -0.054 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 53 | | 52 | 0.8622 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 54 | | 53 | 0.9857 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | | 54 | 0.2029 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 56 | | 55 | -0.786 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 57 | | 56 | -1.031 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58 | | 57 | -0.348 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 59 | | 58 | 0.6553 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 60 | | 59 | 1.0559 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 61 | | 60 | 0.4857 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 62 | | 61 | -0.531 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 63 | | 62 | -1.06 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 64 | | 63 | -0.614 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65 | | 64 | 0.3361 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 66 | | 65 | 1.042 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 67 | | 66 | 0.7238 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 68 | | 67 | -0.253 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 69 | | 68 | -1.004 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70 | | 69 | -0.831 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71 | | 70 | 0.1054 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 72 | | 71 | 0.9451 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 73 | | 72 | 0.3758 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 74 | | 73 | 0.0446 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 75 | | 74 | 0.658 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| 75 | 73 | -0.0446 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76 | 74 | -0.868 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 77 | 75 | -0.382 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 78 | 76 | -0.134 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 79 | 77 | 0.7723 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | 78 | 1.0288 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 81 | 79 | 0.3389 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 82 | 80 | -0.663 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 83 | 81 | -1.055 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 84 | 82 | -0.477 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 85 | 83 | 0.5391 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 86 | 84 | 1.0539 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 87 | 85 | 0.6062 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 88 | 86 | -0.405 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 89 | 87 | -1.044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 90 | 88 | -0.723 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 91 | 89 | 0.2634 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 92 | 90 | 1.0066 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 93 | 91 | 0.8253 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 94 | 92 | -0.115 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 95 | 93 | -0.349 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 96 | 94 | -0.311 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 97 | 95 | -0.035 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 98 | 96 | 0.873 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 99 | 97 | 0.3786 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 | 98 | 0.1844 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | 99 | -0.773 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 102 | 100 | -1.027 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 103 | 101 | -0.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 104 | 102 | 0.6639 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 105 | 103 | 1.0539 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 106 | 104 | 0.4889 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | 105 | -0.547 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 108 | 106 | -1.06 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 109 | 107 | -0.538 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 110 | 108 | 0.4135 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 111 | 109 | 1.0453 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 112 | 110 | 0.7861 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| 109 | 107 | -0.538 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 110 | 108 | 0.4135 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 111 | 109 | 1.0453 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 112 | 110 | 0.7861 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | 111 | -0.272 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 114 | 112 | -1.009 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 115 | 113 | -0.819 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 116 | 114 | 0.1241 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 117 | 115 | 0.3534 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 118 | 116 | 0.9062 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | 117 | 0.0258 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 120 | 118 | -0.878 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 121 | 119 | -0.375 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 122 | 120 | -0.175 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 123 | 121 | 0.7856 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 124 | 122 | 1.0241 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | 123 | -0.321 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 126 | 124 | -0.677 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 127 | 125 | -1.053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 128 | 126 | -0.46 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 129 | 127 | 0.5552 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 130 | 128 | 1.0605 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 131 | 129 | 0.5307 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 132 | 130 | -0.422 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 133 | 131 | -1.047 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 134 | 132 | -0.709 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 135 | 133 | 0.2806 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 136 | 134 | 1.0123 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 137 | 135 | 0.8133 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 138 | 136 | -0.133 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 139 | 137 | -0.358 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 140 | 138 | -0.301 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 141 | 139 | -0.016 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 142 | 140 | 0.8835 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 143 | 141 | 0.3712 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 144 | 142 | 0.1659 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 145 | 143 | -0.732 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 146 | 144 | 1.022 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Chart1 Sheet1

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