

ASSIGNMENT 3

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ENGS 382

300 LEVEL, CIVIL ENGS

$$T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 4$$

$$2T_1 - T_2 + T_3 + 3T_4 + T_5 - 3T_6 = 20$$

$$T_1 + 3T_2 - 8T_3 - T_4 + 2T_5 + T_6 = -15$$

$$5T_1 + 2T_2 - T_3 - T_4 + 2T_5 + T_6 = -3$$

$$-2T_1 - T_2 + 2T_3 + 3T_4 + T_5 + T_6 = 16$$

$$4T_1 + 3T_2 + T_3 - 6T_4 - 3T_5 - 2T_6 = -27$$

Proby

$$5T_1 + 2T_2 - T_3 - T_4 + 2T_5 + T_6 = -3 \quad (1)$$

$$4T_1 + 3T_2 + T_3 + 6T_4 - 3T_5 - 2T_6 = -27 \quad (2)$$

$$2T_1 - T_2 + T_3 + 2T_4 + T_5 - 3T_6 = 20 \quad (3)$$

$$T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 4 \quad (4)$$

$$T_1 + 3T_2 - 3T_3 - T_4 + 2T_5 + T_6 = -15 \quad (5)$$

$$-2T_1 - T_2 + 2T_3 + 3T_4 + T_5 + 3T_6 = 16 \quad (6)$$

$$\text{Eq (1)} \times \frac{1}{5}: 4T_1 + \frac{2}{5}T_2 - \frac{1}{5}T_3 - \frac{1}{5}T_4 + \frac{2}{5}T_5 + \frac{1}{5}T_6 = -\frac{3}{5} \quad (7)$$

$$\text{Eq (2)} \times \frac{2}{5}: 2T_1 + \frac{4}{5}T_2 - \frac{2}{5}T_3 - \frac{2}{5}T_4 + \frac{4}{5}T_5 + \frac{2}{5}T_6 = -\frac{6}{5} \quad (8)$$

$$\text{Eq (3)} \times \frac{1}{5}: T_1 + \frac{2}{5}T_2 - \frac{1}{5}T_3 - \frac{1}{5}T_4 + \frac{2}{5}T_5 + \frac{1}{5}T_6 = -\frac{3}{5} \quad (9)$$

$$\text{Eq (4)} \times \frac{1}{5}: T_1 + \frac{2}{5}T_2 - \frac{1}{5}T_3 + \frac{1}{5}T_4 + \frac{3}{5}T_5 + \frac{1}{5}T_6 = -\frac{3}{5} \quad (10)$$

$$\text{Eq (5)} \times \frac{1}{5}: -2T_1 - T_2 + 2T_3 + 3T_4 + T_5 + 3T_6 = 16 \quad (11)$$

$$\text{Eq (2)} - \text{Eq (7)}: 0 + \frac{7}{5}T_2 + \frac{7}{5}T_3 - \frac{2}{5}T_4 - \frac{23}{5}T_5 - \frac{11}{5}T_6 = -\frac{113}{5} \quad (12)$$

$$\text{Eq (8)} - \text{Eq (9)}: 0 - \frac{1}{5}T_2 + \frac{3}{5}T_3 + \frac{1}{5}T_4 + \frac{1}{5}T_5 - \frac{17}{5}T_6 = -\frac{3}{5} \quad (13)$$

$$\text{Eq (10)} - \text{Eq (9)}: 0 + \frac{1}{5}T_2 - \frac{1}{5}T_3 + \frac{6}{5}T_4 + \frac{13}{5}T_5 - \frac{6}{5}T_6 = -\frac{23}{5} \quad (14)$$

$$\text{Eq (12)} - \text{Eq (13)}: 0 + \frac{13}{5}T_2 - \frac{11}{5}T_3 - \frac{1}{5}T_4 + \frac{9}{5}T_5 + \frac{4}{5}T_6 = -\frac{72}{5} \quad (15)$$

$$\text{Eq (14)} - \text{Eq (15)}: 0 + \frac{4}{5}T_2 + \frac{7}{5}T_3 + \frac{17}{5}T_4 + \frac{11}{5}T_5 + \frac{15}{5}T_6 = -\frac{59}{5} \quad (16)$$

$$q_n(12) \times \frac{-1}{7} : \frac{-1}{5} T_2 - \frac{21}{35} T_3 + \frac{214}{35} T_4 + \frac{201}{35} T_5 + \frac{18}{35} T_6 = 1102 \quad (11)$$

$$q_n(13) \times \frac{13}{7} : \frac{13}{5} T_2 + \frac{172}{35} T_3 - \frac{552}{35} T_4 - \frac{207}{35} T_5 - \frac{76}{35} T_6 = -1527 \quad (12)$$

$$q_n(14) \times \frac{1}{7} : \frac{1}{5} T_2 + \frac{9}{35} T_3 - \frac{26}{35} T_4 - \frac{23}{35} T_5 - \frac{2}{5} T_6 = -123 \quad (13)$$

$$q_n(15) \times \frac{5}{7} : \frac{5}{5} T_2 + \frac{27}{35} T_3 - \frac{28}{35} T_4 - \frac{61}{35} T_5 - \frac{6}{5} T_6 = \frac{391}{35} \quad (14)$$

$$q_n(13) - q_n(17) : 0 + \frac{36}{7} T_3 - \frac{30}{7} T_4 - \frac{40}{7} T_5 - \frac{1}{5} T_6 = -449 \quad (15)$$

$$q_n(14) - q_n(18) : 0 - \frac{18}{7} T_3 + \frac{24}{7} T_4 + \frac{32}{7} T_5 + 0 = \frac{106}{7} \quad (16)$$

$$q_n(15) - q_n(19) : 0 - \frac{43}{7} T_3 + \frac{62}{7} T_4 + \frac{71}{7} T_5 + 6 T_6 = \frac{213}{7} \quad (17)$$

$$q_n(16) - q_n(20) : 0 + \frac{8}{7} T_3 + \frac{33}{7} T_4 + \frac{20}{7} T_5 + 4 T_6 = \frac{746}{35} \quad (18)$$

$q_n(21) \times \frac{-1}{7} :$

$$q_n(21) \times \frac{-1}{13} : \frac{-18}{7} T_3 + \frac{270}{71} T_4 + \frac{360}{91} T_5 + \frac{1}{65} T_6 = \frac{14041}{455} \quad (19)$$

$$q_n(21) \times \frac{-45}{26} : \frac{-43}{7} T_3 + \frac{645}{71} T_4 + \frac{860}{71} T_5 + \frac{45}{13} T_6 = \frac{13207}{110} \quad (20)$$

$$q_n(21) \times \frac{44}{13} : \frac{8}{7} T_3 - \frac{120}{71} T_4 - \frac{160}{71} T_5 - \frac{1}{65} T_6 = -\frac{1170}{455} \quad (21)$$

$$q_n(22) - q_n(25) : 0 + \frac{6}{13} T_4 + \frac{5}{13} T_5 - \frac{1}{65} T_6 = -407 \quad (22)$$

$$q_n(23) - q_n(26) : 0 + \frac{23}{13} T_4 + \frac{1}{13} T_5 + \frac{257}{130} T_6 = \frac{1309}{130} \quad (23)$$

$$q_n(24) - q_n(27) : 0 + \frac{55}{13} T_4 + \frac{10}{13} T_5 + \frac{207}{65} T_6 = \frac{1442}{65} \quad (24)$$

$$\text{eqn (28)} \times \frac{23}{6} : \frac{23}{18} T_4 + \frac{12}{39} T_5 - \frac{69}{130} T_6 = \frac{7361}{370} \quad - (31)$$

$$\text{eqn (28)} \times \frac{29}{3} : \frac{58}{18} T_4 + \frac{232}{39} T_5 - \frac{87}{65} T_6 = \frac{11803}{175} \quad - (32)$$

$$\text{eqn (29)} - \text{eqn (31)} : 0 - \frac{5}{3} T_5 + \frac{8}{15} T_6 = -\frac{209}{15} \quad - (33)$$

$$\text{eqn (30)} - \text{eqn (32)} : 0 - \frac{4}{3} T_5 + \frac{27}{5} T_6 = -\frac{529}{15} \quad - (34)$$

$$\text{eqn (33)} \times 4 : -\frac{4}{3} T_5 + \frac{124}{15} T_6 = -\frac{830}{15} \quad - (35)$$

$$\text{eqn (34)} - \text{eqn (35)} : 0 + \frac{11}{25} T_6 = -\frac{603}{25}$$

$$\therefore 5T_1 + 2T_2 - T_3 - T_4 + 2T_5 + T_6 = -3$$

$$\frac{1}{5} T_2 + \frac{1}{5} T_3 - \frac{26}{5} T_4 - \frac{23}{5} T_5 - \frac{14}{5} T_6 = -\frac{123}{5}$$

$$\frac{26}{7} T_3 - \frac{30}{7} T_4 - \frac{40}{7} T_5 - \frac{1}{5} T_6 = -\frac{449}{35}$$

$$\frac{6}{18} T_4 + \frac{8}{18} T_5 - \frac{1}{65} T_6 = \frac{407}{65}$$

$$-\frac{5}{3} T_5 + \frac{31}{5} T_6 = -\frac{209}{15}$$

$$\frac{11}{25} T_6 = -\frac{603}{25}$$

$$\therefore T_6 = \frac{-603}{25} \times \frac{25}{11}$$

$$T_6 = \frac{-603}{11}$$

$$T_6 = \underline{\underline{-54.82}}$$

$$-\frac{5}{3} T_5 + \frac{31}{5} T_6 = -\frac{209}{15}$$

$$-\frac{5}{3} T_5 = -\frac{209}{15} - \frac{31}{5} (-54.82)$$

$$\frac{-5}{3} T_5 = 325.951$$

$$T_5 = \underline{\underline{-195.5704}}$$

$$\frac{6}{13} T_4 + \frac{8}{13} T_5 - \frac{1}{65} T_1 = 407$$

$$\frac{6}{13} T_4 + \frac{8}{13} (-195.5704) - \frac{1}{65} (-54.82) = 407$$

$$\frac{6}{13} T_4 + \frac{8}{13} T_5 - \frac{1}{65} T_1 = 407$$

$$\frac{6}{13} T_4 + \frac{8}{13} (-195.5704) - \frac{1}{65} (-54.82) = 407$$

$$\frac{6}{13} T_4 = 120.3510 + 7.5905 = 127.9415$$

$$\frac{6}{13} T_4 = 119.0220$$

$$T_4 = \underline{\underline{257.8811}}$$

$$\frac{26}{7} T_3 - \frac{30}{2} T_4 - \frac{40}{7} T_5 - \frac{1}{5} T_6 = -449$$

$$\frac{26}{7} T_3 - \frac{30}{2} (257.8811) - \frac{40}{7} (-195.5704) - \frac{1}{5} (-54.82) = -449$$

$$\frac{26}{7} T_3 = 1105.207174 + 1117.545143 + 10.964 = 2233.716317$$

$$\frac{26}{7} T_3 = -36.133$$

7

$$T_3 = -9.7281$$

$$\frac{7}{5} T_2 + \frac{2}{5} T_3 - \frac{26}{5} T_4 - \frac{28}{5} T_5 - \frac{14}{5} T_6 = -123$$

$$\frac{7}{5} T_2 = \frac{123}{5} - \frac{2}{5} (-9.7281) + \frac{26}{5} (257.8811) + \frac{28}{5} (-195.5704) + \frac{14}{5} (-54.82)$$

$$\frac{7}{5} T_2 = 250.77246$$

5

$$T_2 = 200.5518$$

$$5\bar{I}_1 + 2\bar{I}_2 - \bar{I}_3 - \bar{I}_4 + 2\bar{I}_5 + \bar{I}_6 = -3$$

$$5\bar{I}_1 = -3 - 2(200.5518) + (-9.7281) + (257.3811) - 2(-195.5704) - (-54.82)$$

$$5\bar{I}_1 = 290.002$$

$$\bar{I}_1 = \underline{\underline{58.00204}}$$

$$\bar{I}_1 = \underline{\underline{58.00204}}, \bar{I}_2 = \underline{\underline{200.5518}}, \bar{I}_3 = \underline{\underline{-9.7281}}$$

$$\bar{I}_4 = \underline{\underline{257.384}}, \bar{I}_5 = \underline{\underline{-195.5704}}, \bar{I}_6 = \underline{\underline{-54.82}}$$