

Project Due Date: 2/6/2016

Level 1: Maximum Possible Grade 10

Submittals: MatLab File – Snapshots of Solution – Comparison with SAP2000 Solution for Level 1 Projects including Finite Element Analysis – Graphs showing deformations.

Project	Description
Number	Description
1	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	2.4 m 1.8 m U ₃ U ₄ U ₄
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
2	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
3	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $P_{2} \xrightarrow{P_{4}} P_{4} \xrightarrow{P_{4}} P_{2}$ $P_{2} \xrightarrow{P_{4}} P_{3} \xrightarrow{P_{3}} P_{2}$ $P_{2} \xrightarrow{P_{4}} P_{4} \xrightarrow{P_{4}} P_{2}$ $P_{2} \xrightarrow{P_{4}} P_{4} \xrightarrow{P_{4}} P_{2}$ $P_{2} \xrightarrow{P_{4}} P_{3} \xrightarrow{P_{4}} P_{3}$
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.



Project Number	Description
	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $f_3, u_3 \uparrow$ f_2, u_2
4	$L^{(3)} = 10\sqrt{2}$ $E^{(3)}A^{(3)} = 200\sqrt{2}$ (3) (2) (3) (2) (5) (3) (2) (5) (2) (5) (5) (2) (5) (5) (5) (5) (5) (5) (5) (5) (5) (5
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
5	3 m = 8 $1 m = 7 4 4$ $4 m = 4 m = 10 kN$
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
6	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\oint_{f_{y2}=0}$
	$H = \begin{bmatrix} F, A^{(1)} & F_{x2} \\ F, A^{(1)} & F_{x2} \\ F, A^{(1)} & F_{x2} \\ F, A^{(2)} \\ F, A^{(2)$
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member. (S=5m, H=3m)



Project Number	Description
7	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	d = 6 m
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
8	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: 5kN 5kN 5kN 60m Stiffnesses of the members are k = EA/L where E is the modulus of elasticity, A represents the cross sectional area and L is the length of
9	the member. Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} 10 \text{ kN} & 10 \text{ kN} \\ \hline & & & \\ \hline \end{array} \end{array} $



Project Number	Description
10	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} $
11	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $30 kN \xrightarrow{60 kN} \xrightarrow{30 kN} \xrightarrow{10} \text{m}$ $B \xrightarrow{10} \text{m} 10$
12	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\frac{B}{K} = \frac{C}{75 \text{ kN}} + \frac{B}{75 \text{ kN}} + \frac{C}{75 k$



Project Number	Description
13	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} $
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
14	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $12 \text{ kN} \qquad 50 \text{ kN} \qquad 25 \text{ kN} \qquad 50 \text{ kN} \qquad 25 \text{ kN} \qquad 50 $
15	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} $



Project Number	Description
16	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} 12 \text{ kN} \\ \hline & & & \\ & &$
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
17	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} $
18	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} $



Project	Description
Number	-
19	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	5 kN 30 kN 30° E C B C C B C C C C C C C C C C C C C
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
20	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: 3.5 m $3.5 m$ $3.5 m$ $3.5 m$ $3.5 m$ $3.5 m$ $10 kNF V_F V_F$
21	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $H_{B} \xrightarrow{P_{B}} \underbrace{C}_{P_{B}} \underbrace{C}_{P_{B}$



Project Number	Description
22	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: 30.0 kN $H_{A} = 60^{\circ}$ B_{A} C_{A} C_{B}
23	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $y = \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{15 \text{ kN}} + \frac{50 \text{ kN}}{15 \text{ kN}} + \frac{15 \text{ kN}}{15 \text{ kN}} + \frac{100 \text{ kN}}{15 \text{ kN}} + \frac{50 \text{ kN}}{15 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{15 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{15 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{100 \text{ kN}} + \frac{50 \text{ kN}}{100 \text{ kN}} + \frac{100 \text{ kN}}{100 kN$
24	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ I = \underbrace{I = I = \underbrace{I = \underbrace{I = \underbrace{I = I = \underbrace{I = I = \underbrace{I = I = \underbrace{I = I = I = \underbrace{I = I = I = I = I = I = I = I = I = I =$



Project	Description
Number	
25	Develop a MatLAB program that can determine the displacements at
	different nodes and forces in members for the following 2-D truss:
	30 kN
	B E
	D
	II a a
	3.0 m 3.0 m
	$V_{\rm A}$ $V_{\rm C}$
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of
	elasticity, A represents the cross sectional area and L is the length of
	the member.Develop a MatLAB program that can determine the displacements at
	different nodes and forces in members for the following 2-D truss:
	$V_{\rm C}$
	$C \rightarrow H_C$
	E
	2.0 п
26	P. ATIN
20	B 25 kN
	2.0 m 2.0 m
	A 45° D
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of allocitative. A represente the group spatial area and L is the length of
	elasticity, A represents the cross sectional area and L is the length of the member.
<u> </u>	Develop a MatLAB program that can determine the displacements at
	different nodes and forces in members for the following 2-D truss:
	300 N
	400 N D \mathbf{Y} C \mathbf{C}
	2 m
27	
	250 N
	¥ 200 N
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of
	elasticity, A represents the cross sectional area and L is the length of
	the member.



Project Number	Description
Tumber	Develop a MatLAD program that can determine the displacements at
28	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of
	elasticity, A represents the cross sectional area and L is the length of the member $(\Theta = 30^{\circ})$
29	the member. ($\Theta = 30^{\circ}$) Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \begin{array}{c} $
30	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \frac{2}{m} + \frac{1}{2} + \frac{1}{m} + $



Number Description Develop a MatLAB program that can determine the displacements different nodes and forces in members for the following 2-D truss:	at
	at
different nodes and forces in members for the following 2-D truss:	
31	
Stiffnesses of the members are $k = EA/L$ where E is the modulus of	f
elasticity, A represents the cross sectional area and L is the length	of
the member.	
Develop a MatLAB program that can determine the displacements different nodes and foreas in members for the following 2 D trues	at
different nodes and forces in members for the following 2-D truss:	
600 Ib 800 Ib	
32	
Stiffnesses of the members are $k = EA/L$ where E is the modulus of	
elasticity, A represents the cross sectional area and L is the length	of
the member. Develop a MatLAB program that can determine the displacements	at
different nodes and forces in members for the following 2-D truss:	
4 kN	
33 Stiffnesses of the members are $h = EA/I$, where E is the medulus of	£
Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length	
the member.	51



Project Number	Description
34	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	3 kN $2 kN4 m$ D C D C D D D C D
	Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
35	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\int_{A}^{C} \int_{A} \int_{B} \int_{A} ft = \int_{B} \int_{A} ft = \int_{B} \int$
36	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: F G G G G G G G G G G



Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\frac{1 \text{ m}}{H} = \frac{1}{F}$
$2 \frac{m}{P}$ $A = \frac{B}{P}$ $B = \frac{C}{P}$ $B = \frac{D}{P}$ $B = \frac{D}{P}$ $B = \frac{D}{P}$ $C $
Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\frac{1}{3m} = \frac{1}{4} + $
$ \begin{array}{c} B \\ -2 \\ m \\ $
Stiffnesses of the members are $k = EA/L$ where E is the modulus of elasticity, A represents the cross sectional area and L is the length of the member.
Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\begin{array}{r} & & & \\ & $



Project Number	Description
40	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $\frac{F}{4 \text{ ft}} + \frac{F}{3 \text$



Level 2: Maximum Possible Grade 7

Submittals: MatLab File – Snapshots of Solution – Comparison with MatLAB Built-in function solution.

Project Number	Description
1	Develop a MatLAB program that can solve a system of linear algebraic equations (5 equations) using an iterative method.
2	Develop a MatLAB program that can decompose a matrix using Choleski's decomposition method and compare the efficiency of your solution with the built-in function.
3	Develop a MatLAB program that can decompose a matrix using Doolittle's decomposition method and compare the efficiency of your solution with the built-in function.
4	Develop a MatLAB program that can determine the determinant of a matrix and compare the efficiency of your solution with the built-in function.
5	Develop a MatLAB program that can solve a system of linear algebraic equations using Gauss Elimination method.
6	Develop a MatLAB program that can determine the inverse of a matrix using LU decomposition with pivoting. (Do not use the built-in LU decomposition function)
7	Develop a MatLAB program that can determine the eigen values and the eigen vectors for a matrix using iterative method and compare the efficiency of your solution with the built-in function.
8	Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. $f(x) = 3x^5 + 2x^2 + x - 10$ (Do not use the built-in function)
9	Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. $f(x) = 3x^5 + 2x^2 + x - 10$ (Do not use the built-in function)
10	Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. $f(x) = 3x^5 + 2x^2 + x - 10$ (Do not use the built-in function)
11	Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. $f(x) = x - \cos(x)$ (Do not use the built-in function)
12	Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. $f(x) = x - \cos(x)$ (Do not use the built-in function)



NumberDescription13Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. $f(x) = x - \cos(x)$ (Do not use the built-in function)14Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. $f(x) = x^2-3sin(x)+2$ (Do not use the built-in function)15Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. $f(x) = x^2-3sin(x)+2$ (Do not use the built-in function)16Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. $f(x) = x^2-3sin(x)+2$ (Do not use the built-in function)16Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. $x, \cosh(50/x)=x+10$ (Do not use the built-in function)17Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. $x, \cosh(50/x)=x+10$ (Do not use the built-in function)18Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. $x, \cosh(50/x)=x+10$ (Do not use the built-in function)19Develop a MatLAB program that can search for the minimum value for: $F(x) = 2 - e^{-(x-5)^2}$ Using Newton Method. (Do not use the built-in function)20Develop a MatLAB program that can search for the minimum value for: $F(x) = 2 - e^{-(x-5)^2}$ Using Newton Method. (Do not use the built-in function)21Develop a MatLAB program that can search for the minimum value for: $F(x) = 2 - e^{-(x-5)^2}$ Using Newton Method. (Do not use th	Project	Description
13nonlinear equation:using the false position method.13f(x) = x - cos (x) (Do not use the built-in function)Develop a MatLAB program that can determine the roots for the nonlinear equation:14Develop a MatLAB program that can determine the roots for the nonlinear equation:15Develop a MatLAB program that can determine the roots for the nonlinear equation:16Develop a MatLAB program that can determine the roots for the nonlinear equation:16Develop a MatLAB program that can determine the roots for the nonlinear equation:16Develop a MatLAB program that can determine the roots for the nonlinear equation:17Develop a MatLAB program that can determine the roots for the nonlinear equation:18Develop a MatLAB program that can determine the roots for the nonlinear equation:19Develop a MatLAB program that can determine the roots for the nonlinear equation:19Develop a MatLAB program that can determine the roots for the nonlinear equation:19Develop a MatLAB program that can determine the roots for the nonlinear equation:20 $F(x) = 2 - e^{-(x-5)^2}$ Using Fibonacci Method. (Do not use the built-in function)21Develop a MatLAB program that can search for the minimum value for:21 $F(x) = 2 - e^{-(x-5)^2}$ Using Newton Method. (Do not use the built-in function)22Develop a MatLAB program that can search for the minimum value for:22F(x) = 2.sin(x) - x²/10	Number	Description
13f(x) = x - cos (x) (Do not use the built-in function)14Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. f(x) = x ² -3sin(x)+2 (Do not use the built-in function)15Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. f(x) = x ² -3sin(x)+2 (Do not use the built-in function)16Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. f(x) = x ² -3sin(x)+2 (Do not use the built-in function)16Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. f(x) = x ² -3sin(x)+2 (Do not use the built-in function)17Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. x.cosh(50/x)=x+10 (Do not use the built-in function)18Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. x.cosh(50/x)=x+10 (Do not use the built-in function)19Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. x.cosh(50/x)=x+10 (Do not use the built-in function)20F(x) = 2 - e^{-(x-5)^2} Using Fibonacci Method. (Do not use the built-in function)21F(x) = 2 - e^{-(x-5)^2} Using Newton Method. (Do not use the built-in function) Develop a MatLAB program that can search for the minimum value for: F(x) = 2 - e^{-(x-5)^2} Using Newton Method. (Do not use the built-in function) Develop a MatLAB program that can search for the minimum value for: F(x) = 2.sin(x) - x ² /10	13	Develop a MatLAB program that can determine the roots for the
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		nonlinear equation: using the false position method.
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14nonlinear equation: using Newton-Raphson method. f(x) = x^2-3sin(x)+2 (Do not use the built-in function)15Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. f(x) = x^2-3sin(x)+2 (Do not use the built-in function)16Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. f(x) = x^2-3sin(x)+2 (Do not use the built-in function)16Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. f(x) = x^2-3sin(x)+2 (Do not use the built-in function)17Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. x.cosh(50/x)=x+10 (Do not use the built-in function)18Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. x.cosh(50/x)=x+10 (Do not use the built-in function)19Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. x.cosh(50/x)=x+10 (Do not use the built-in function)20Develop a MatLAB program that can search for the minimum value for: F(x) = 2 - e^{-(x-5)^2} Using Fibonacci Method. (Do not use the built-in function)21Develop a MatLAB program that can search for the minimum value for: F(x) = 2 - e^{-(x-5)^2} Using Newton Method. (Do not use the built-in function)22Develop a MatLAB program that can search for the maximum value for: F(x) = 2.sin(x) - x^2/10		
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Project Number	Description
23	Develop a MatLAB program that can search for the maximum value for: $F(x) = 2.\sin(x) - x^2/10$
24	Using Newton Method. (Do not use the built-in function) Develop a MatLAB program that can search for the maximum value for: $F(x) = -x^2 + 8x$ Using Fibonacci Method. (Do not use the built-in function)
25	Develop a MatLAB program that can search for the maximum value for: $F(x) = -x^2 + 8x$ Using Newton Method. (Do not use the built-in function)
26	Develop a MatLAB program that can search for the maximum value for: $F(x) = x^3 - 6x^2 + 9x$ Using Fibonacci Method. (Do not use the built-in function)
27	Develop a MatLAB program that can search for the maximum value for: $F(x) = x^3 - 6x^2 + 9x$ Using Newton Method. (Do not use the built-in function)