

# **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 Number	Description
1	Develop a MatLAB program that can determine the displacements a different nodes and forces in members for the following 2-D truss:
	2.4 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.
2	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $P_6$
3	the member.  Develop a MatLAB program that can determine the displacements a different nodes and forces in members for the following 2-D truss: $ \begin{array}{cccccccccccccccccccccccccccccccccc$
	elasticity, A represents the cross sectional area and L is the length of the member.

Project	Description
Number	_ 5555- <b>F</b> 5555
	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  $ $ f_2, u_2$
4	$L^{(3)} = 10\sqrt{2}$ $E^{(3)}A^{(3)} = 200\sqrt{2}$ $X$ $X$ $L^{(2)} = 10$ $E^{(2)}A^{(2)} = 50$ $f_1, u_1$ $L^{(1)} = 10$
	$E^{(1)}A^{(1)} = 100$ 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.
5	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.
6	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss: $ \frac{f_{y_2} = 0}{u_{x_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:  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:  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.
9	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:    10 kN



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:    Compared   Compared
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   60 kN   60 kN   60 kN   60 kN   60 kN   30 kN
12	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.

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:
	B  E 0%  A.0 m  4.0 m  4.0 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.
14	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.
15	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.



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:
	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:  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.
18	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.



Project Number	Description
19	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	S kN 30 kN  B G G G  HA  VA  VG  HG  VG
	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:  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.
21	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:  **Base 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
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  3.0 m  3.0 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.
23	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.
24	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.



Project Number	Description
25	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.
26	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:   Local Brown 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.
27	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:    300 N



Project Number	Description
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 members $(Q = 20\%)$
	the member. ( $\Theta = 30^{\circ}$ ) Develop a MatLAB program that can determine the displacements at
29	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.
30	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:  2 m 2 m 2 m 2 m 2 m 2 m 2 m 2 m 2 m 2



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Project	Description
Number	
31	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.
	Develop a MatLAB program that can determine the displacements at
	different nodes and forces in members for the following 2-D truss:
	600 lb 800 lb
	, 60°
32	4 ft 3 ft — 3 ft
	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	$\frac{3 \text{ m}}{B}$ $\frac{3 \text{ m}}{C}$ $\frac{3 \text{ m}}{D}$ $\frac{3 \text{ m}}{D}$
	5 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.



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:
	$\frac{3 \text{ kN}}{A} = 3 \text{ m}$
	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.
35	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.
36	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.

Project Number	Description
37	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 ccccccccccccccccccccccccccccccccccc$
	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.
38	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:
	3 m A D E F G -2 m-2 m-2 m-2 m-2 m-2 m-2 m-2 m-2 m-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.
39	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

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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:    A
41	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:     Y
42	Develop a MatLAB program that can determine the displacements at different nodes and forces in members for the following 2-D truss:  1000 N  0.5 m  1500 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.



## **Level 2: Maximum Possible Grade 7**

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

Project	D	
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)	

Project Number	Description
13	Develop 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)
14	Develop a MatLAB program that can determine the roots for the nonlinear equation: using Newton-Raphson method. $f(x) = x^2-3\sin(x)+2$ (Do not use the built-in function)
15	Develop a MatLAB program that can determine the roots for the nonlinear equation: using the bisection method. $f(x) = x^2-3\sin(x)+2$ (Do not use the built-in function)
16	Develop a MatLAB program that can determine the roots for the nonlinear equation: using the false position method. $f(x) = x^2-3\sin(x)+2$ (Do not use the built-in function)
17	Develop 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)
18	Develop 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)
19	Develop 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)
20	Develop 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)
21	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)
22	Develop a MatLAB program that can search for the maximum value for: $F(x) = 2.\sin(x) - x^2/10$ Using Fibonacci Method. (Do not use the built-in function)

Project Number	Description
23	Develop a MatLAB program that can search for the maximum value for: $F(x) = 2.\sin(x) - x^2/10$ Using Newton Method. (Do not use the built-in function)
24	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)