I D NO.	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 40 % Max Marks: 80 Max Time: 2 hrs. 11 May 2018, Friday

ENDTERM FINAL EXAMINATION MAY 2018

Even Semester 2017-18 Course: **MEC 309 Finite Element Methods** IV Sem. Mechanical

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Instructions:

(i) *Read the question properly and answer accordingly.*
(ii) *Question paper consists of 3 parts.*
(iii) Scientific and Non-programmable calculators are permitted

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Part A

(2 Q x 10 M = 20 Marks)

1. Explain the following

   i) Pascal triangle ii) Convergence criteria iii) Compatibility condition.

2. Explain the concept of iso parametric, sub parametric and super parametric elements and their uses.

Part B

(3 Q x 10 M = 30 Marks)

3. Derive the elemental stiffness matrix, stress and strain of a truss element
4. Derive an equation to show the total potential energy of a beam element.
5. Derive the shape function for a 1D - 2noded beam element.

Part C

(2Q x 15 M = 30 Marks)

6. Analyze the two member truss shown in Fig.1. Assume EA to be constant for all members. The length of each member is 5m.

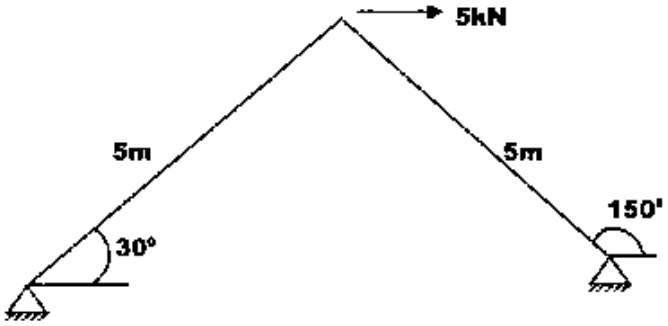

Fig. 1

7. For the beam and loading shown in fig. 2 determine the slopes at 2 and 3. The vertical deflection at the midpoint of the distributed load.

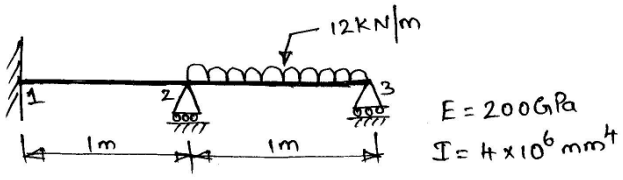

Fig. 2

ID NO:	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20% Max Marks: 40 Max Time: 1 hr. 28 March Wednesday 2018

TEST – 2 **SET A**

Even Semester 2017-18 Course: **MEC 309 Finite Element Methods** VI Sem. Mechanical

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Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

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Part A

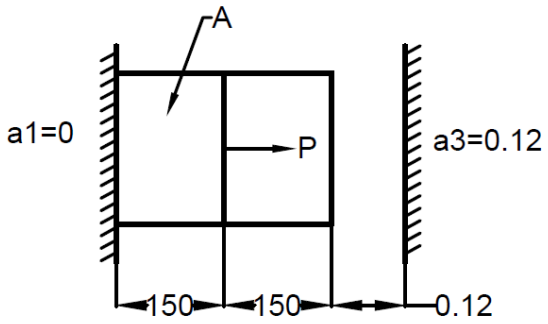
(2 Q x 4 M = 8 Marks)

1. List the basic element shapes used in FEM with neat sketch.
2. Explain node numbering scheme with an example.

Part B

(2 Q x 10 M = 20 Marks)

3. Derive the linear interpolation polynomial for a basic 1D bar element in terms of global coordinates.
4. For a bar shown in fig. 1 using penalty method find nodal displacements and reaction at the support. E = 2 x 10^5 N/mm^2.



P = 60 KN
A = 250 Sq mm

Fig. 1

Part C

(1Q x 12 M = 12 Marks)

5. A tapered bar of unit thickness shown in fig. 2 is subjected to a point load. Accounting to the body force, the weight density f = 46.6 x 10^{-6} N/mm^2, E = 200 GPa & P = 1000 N

   i) Model the plate into 2 bar elements.

   ii) Determine the elemental & global stiffness matrix

   iii) Determine the global force vector

   iv) Using elimination method find the nodal displacement

   v) Find the reactions at the supports

   vi) Find the stresses in each element.

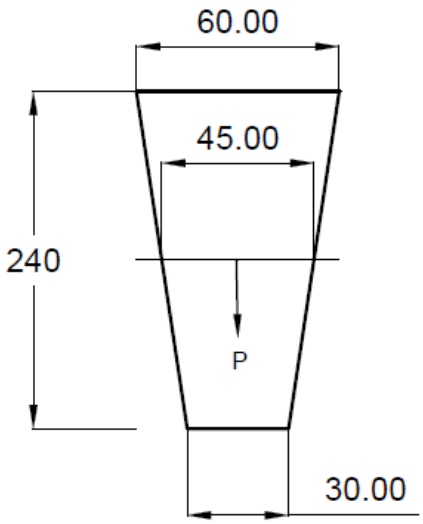


Fig. 2

ID NO:	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20 % Max Marks: 40 Max Time: 1 hr. 20 Feb Tuesday 2018

TEST – 1

Even Semester 2017-18 Course: **MEC 309 Finite Element Method** VI Sem. Mechanical

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Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

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Part A

(1 Q x 8 M = 8 Marks)

1. Briefly explain the basic steps involved in FEM.

Part B

(2 Q x 10 M = 20 Marks)

2. For the spring system shown figure-1 below find Global stiffness matrix and displacements, given K_1=100N/mm, K_2=200N/mm, K_3= - 100N/mm, P=500N

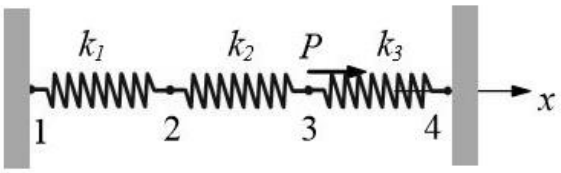

Fig.1

3. Determine the values of X_1, X_2 & X_3 using Gauss elimination method.

$10X_1 + 7X_2 + 5X_3 = - 5$
$6X_1 + 4X_2 - 2X_3 = - 4$
$5X_1 - 2X_2 + 4X_3 = 3$

Part C

(1Q x 12 M = 12 Marks)

4. For a bar shown in figure -2. Determine the displacement at the loading point using RR method. Assume 2nd order polynomial for the displacement model.

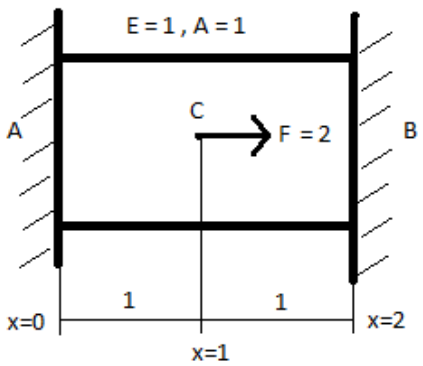

Fig. 2