Finite Element Analysis Final Exam Spring 2022

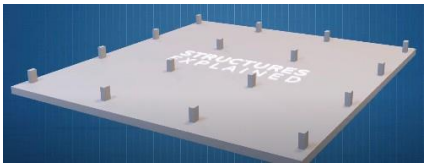
Answer the following questions in English or Korean.

1. When FE analysis is performed for the main structure of the following buildings, explain the primary action or behavior of the structure, adequate element types, considerations in the structural analysis.

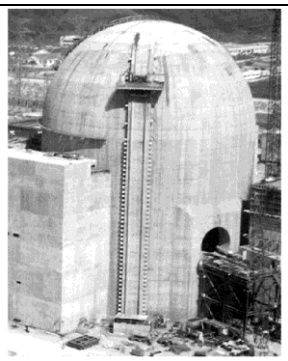
(a) Concrete shell

(b)Fabric tension structure

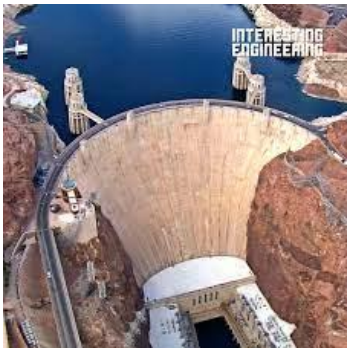
(c) Steel dome structure



(d) Concrete mat foundation of building

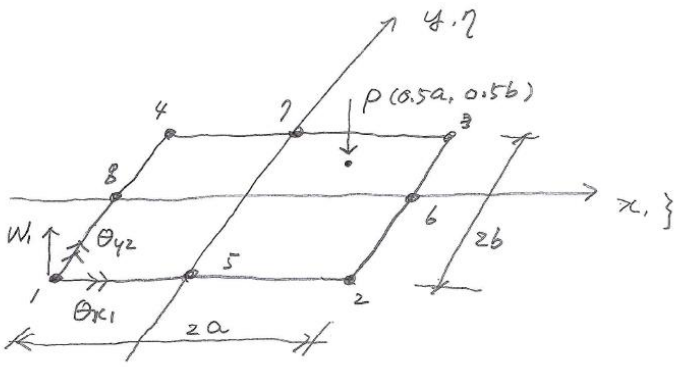


(e) Nuclear power plant containment structure.

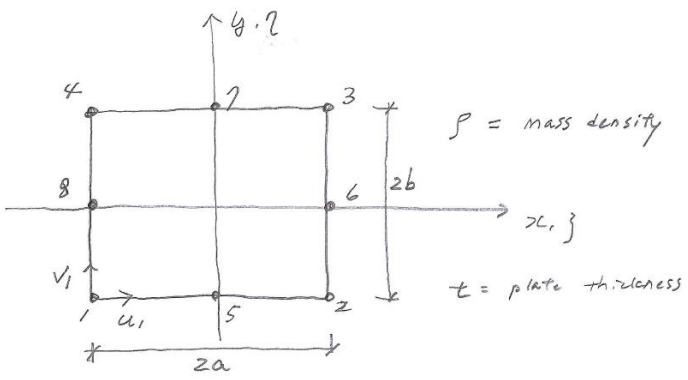


(f) hoover dam

2. For the following 8 – node plate bending element,
(a) define the displacement shape functions for the nodal dofs when Mindlin theory is used.
(b) Calculate the equivalent nodal forces due to the body force.



3. For the dynamic analysis of the following 8-node plane element,
(a) Calculate the components of the consistent mass matrix : M(1,1) and M(1,8)
(b) define the Lumped mass matrix.



4. For 3-D stress components (3 normal stresses and 3 shear stresses), explain how the principal stresses and the directions can be calculated.

5. Regarding stress invariants,
(a) What is the meaning of the stress invariants?
(b) Explain the importance of stress invariants when material yield (or failure) criteria is defined.

6. When large deformation is considered for plate bending plate element subjected to compression in-plane force, define the relationship between the strains and deformations (u, v, w).

7. When geometric nonlinear analysis is considered, explain the difference between step-by-step nonlinear analysis and linearized stability analysis.