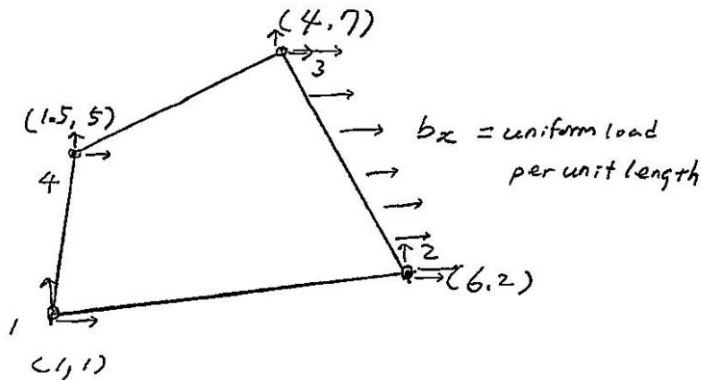
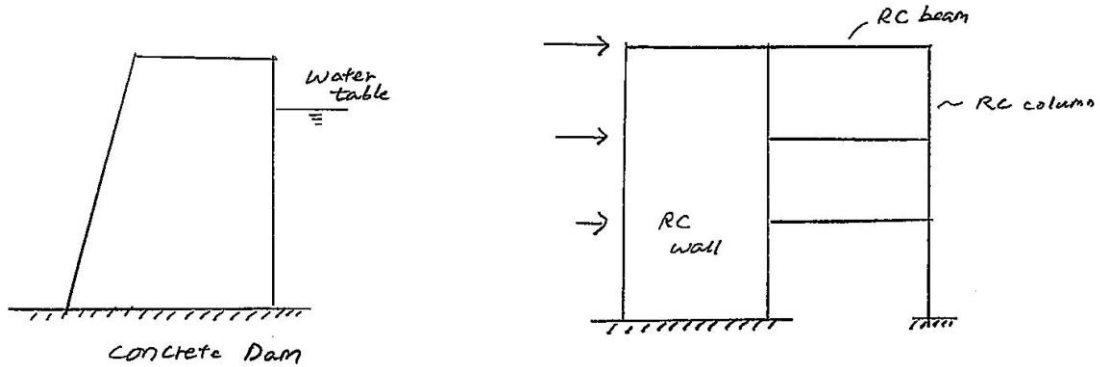


Answer the following questions in English or Korean.

1. In Finite Element analysis, “as the number of node and element is increased, the solution of FE analysis monotonically converges to the exact solution.” Discuss the requirements for this claim.
2. In general, the accuracy of strain and stress obtained from finite element analysis is lower than that of displacement. Explain the reason.
3. For the following isoparametric quadrilateral 4 node elements.
 - 1) Define x and y corresponding to normalized coordinates ($\zeta = 0.5, \eta = 0.5$)
 - 2) Define the Jacobian matrix
 - 3) Calculate the equivalent nodal loads due to the distributed loading



4. For the following two plane structures, show the modeling, element type, constitutive relationship for FE analysis.



5. Perform numerical integration for $\int x^3 y \, dA$
using Gaussian integration ($-1 < x < 1$, $-1 < y < 1$)

6. For plane stress and plane strain problems (in x-y axes), define the constitutive relationship between strain and stress with elastic modulus, poisson ratio, and shear modulus.

7. Define the shape functions of 4 node quadrilateral element with incompatible bending mode, and discuss the advantages and disadvantages of the incompatible element.

TABLE B.1 Coefficients for Gaussian Quadrature

n	$\pm\xi_i$	R_i
1	0.0	2.0
2	0.5773502692	1.0
3	0.7745966692 0.0	0.5555555556 0.8888888889
4	0.8611363116 0.3399810436	0.3478548451 0.6521451549
5	0.9061798459 0.5384693101 0.0	0.2369268851 0.4786286705 0.5688888889
6	0.9324695142 0.6612093865 0.2386191861	0.1713244924 0.3607615730 0.4679139346
7	0.9491079123 0.7415311856 0.4058451514 0.0	0.1294849662 0.2797053915 0.3818300505 0.4179591837
8	0.9602898565 0.7966664774 0.5255324099 0.1834346425	0.1012285363 0.2223810345 0.3137066459 0.3626837834