Week 4: Assignment

1) Find the minimum number of quadrature points \( r \) required to integrate a polynomial of order 8 using Gauss quadrature numerical integration scheme?

- \( r=7 \)
- \( r=4 \)
- \( r=5 \)
- \( r=3 \)

2) Consider a mass matrix \([M]\) such that \( M_{ij}^e = \int_a^b \phi_i^e \phi_j^e dx \) where \( \phi_i^e \) and \( \phi_j^e \) are cubic interpolation functions. What is the minimum number of quadrature points \( r \)?

- \( r=3 \)
- \( r=4 \)
- \( r=5 \)
- \( r=2 \)

3) Consider a stiffness matrix \([K]\) such that \( K_{ij}^e = \int_a^b \phi_i^e \phi_j^e \phi_i^e' \phi_j^e' dx \) where \( \phi_i^e \) and \( \phi_j^e \) are linear interpolation function. What is the minimum number of quadrature points \( r \)?

- \( r=1 \)
- \( r=2 \)
- \( r=3 \)
- \( r=4 \)

4) In Gaussian quadrature, the stiffness matrix for an element can be expressed as \( K_{ij}^e = \sum_{t=1}^{r \_t} \tilde{F}_i^t \xi_j^t W_t \). Here the index \( t \) is associated with:

- Geometric approximations.
- Interpolation functions for primary variable.
- Interpolation functions for secondary variable.
- None of above.

5) In Gaussian quadrature, the stiffness matrix for an element can be expressed as \( K_{ij}^e = \sum_{t=1}^{r \_t} \tilde{F}_i^t \xi_j^t W_t \). Here the index \( i \) and \( j \) are associated with:

- Geometric approximations.
- Interpolation functions for primary variable.
- Interpolation functions for secondary variable.
- None of above.

6) For isoparametric formulation with three interpolation functions \( (m=3) \), the minimum number of quadrature points \( (r) \) to ensure accurate integration should be:

- \( r=3 \)
- \( r=4 \)
- \( r=5 \)
- \( r=2 \)

7) Calculate the value of integral \( \int_{-1}^{1} 5x e^{-2x} dx \) using 3 point Gauss quadrature rule:

- \( 1.036 \)
- \( 0.9101 \)
8) The interpolation function for a two dimensional FEA problem depends on the:

- Number of nodes in the element.
- Shape of the element.
- Both a and b
- None of the above.

1 point

9) In Newton-Cotes scheme for numerical integration, first quadrature point is ________ of the 5 noded 1-D linear element.

- Coincides with central node
- Coincides with last node
- Coincides with second last node
- Coincides with first node

1 point

10) In gauss quadrature numerical integration scheme sampling points are _______. (p is the order of polynomial.)

- Symmetrically arranged with respect to center of intervals.
- Non-symmetrically arranged with respect to center of intervals.
- Symmetrically arranged after pth node.
- Non-symmetrically arranged after pth node.

1 point