NPTEL Online Certification

COMPUTATIONAL HYDRAULICS
Week 5 : Assignment
July 24-October 13, 2017

NOTE: Make suitable assumptions, wherever necessary.

1. In Polynomial Interpolation Method, derivative of weight function at a point depends on

(a) **Derivative of the polynomial basis**
(b) **Points in the support domain including the point under consideration**
(c) Points in the support domain excluding the point under consideration

2. Moving Least Squares method utilizes

(a) **Weighted error minimization approach**
(b) Weighted error maximization approach

3. Weight function in Moving Least Squares method should be

(a) **Positive valued within support domain**
(b) **Zero outside support domain**
(c) Negative valued outside support domain
(d) Does not depend on support domain

4. Space Time Moving Least Squares method utilizes

(a) **Taylor Series expansion to represent derivatives**
(b) Maclaurin Series expansion to represent derivatives

5. Space time polynomial basis for two-dimensional in space and one-dimensional in time contains

(a) 11 terms
(b) 9 terms
(c) 8 terms
(d) **10 terms**

6. In weight function calculation for Space time Moving Least Squares method, norm correction is performed to

(a) Neutralize the effect of order difference between spatial variables
(b) **Neutralize the effect of order difference between spatial and temporal variables**

7. In Scilab, execute $det(A)$ [determinant] for

$$\mathbf{A} = \begin{pmatrix} 1 & 2 & -3 & 4 & 5 \\ 0 & 3 & -5 & -7 & 9 \\ 5 & -4 & 3 & -2 & 1 \\ 1 & 4 & -7 & -10 & 13 \\ -15 & 13 & 11 & -9 & 2 \end{pmatrix} \tag{1}$$

The determinant value is

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(a) 3994
(b) 3394
(c) **3944**

8. In Scilab, execute $inv(A)$ [inverse] for

$$\mathbf{A} = \begin{pmatrix} 1 & 2 & -3 & 4 & 5 \\ 0 & 3 & -5 & -7 & 9 \\ 5 & -4 & 3 & -2 & 1 \\ 1 & 4 & -7 & -10 & 13 \\ -15 & 13 & 11 & -9 & 2 \end{pmatrix} \tag{2}$$

The value of $(3, 3)$ term of the inverse matrix is

(a) -0.1340241
(b) 0.1340241
(c) 0.2866184
(d) **0.1389452**

9. In Scilab, use *gausselim.sci* to solve the following problem

$$\begin{pmatrix} 1 & 2 & -3 & 4 & 5 \\ 0 & 3 & -5 & -7 & 9 \\ 5 & 1 & 3 & -2 & 1 \\ 1 & 4 & -7 & 1 & 13 \\ 10 & 13 & 11 & -9 & 2 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \end{Bmatrix} = \begin{Bmatrix} 37 \\ 8 \\ 13 \\ 57 \\ 43 \end{Bmatrix}$$

The value of ϕ_3 term of the inverse matrix is

(a) 1
(b) 2
(c) **3**
(d) 4
(e) 5

10. In Scilab, use $\boldsymbol{\phi} = \mathbf{A} \setminus \mathbf{r}$ to solve the following problem

$$\mathbf{A} = \begin{pmatrix} 1 & 2 & -3 & 4 & 5 \\ 0 & 3 & -5 & -7 & 9 \\ 5 & 1 & 3 & -2 & 1 \\ 1 & 4 & -7 & 1 & 13 \\ 10 & 13 & 11 & -9 & 2 \end{pmatrix}$$

$$\mathbf{r} = \begin{Bmatrix} 37 \\ 8 \\ 13 \\ 57 \\ 43 \end{Bmatrix}$$

The value of ϕ_2 term of the inverse matrix is

(a) 1
(b) **2**
(c) 3
(d) 4
(e) 5