

National Testing Agency

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Numerical Methods in Civil Engineering

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Numerical Methods in Civil Engineering-1

Section Id :	603489172
Section Number :	1
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Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	603489309
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 6034898469 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

Which one of the following time marching method is unconditionally stable?

- 1. Newmark’s Linear Acceleration Method
- 2. Central Difference Method
- 3. Explicit Euler’s Method
- 4. Newmark’s Average Acceleration Method

Options :
60348931835. 1
60348931836. 2
60348931837. 3
60348931838. 4

Question Number : 2 Question Id : 6034898470 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

Linear acceleration method is _____ stable.

Average acceleration method is _____ stable.

1. Conditionally, Unconditionally
2. Unconditionally, Conditionally
3. Unconditionally, Unconditionally
4. Conditionally, Conditionally

Options :

60348931839. 1

60348931840. 2

60348931841. 3

60348931842. 4

Question Number : 3 Question Id : 6034898471 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Solving boundary value problems by Difference Method leads to

1. Matrix in Row echelon form
2. Column vector
3. Tridiagonal system
4. Diagonal matrix

Options :

60348931843. 1

60348931844. 2

60348931845. 3

60348931846. 4

Question Number : 4 Question Id : 6034898472 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which one of the following is TRUE for a singular matrix A (size $n \times n$)?

1. Rows of matrix A are linearly independent
2. Unique solution exists for a system $Ax=b$
3. Matrix A is rank deficit
4. Determinant of matrix A is non-zero

Options :

60348931847. 1

60348931848. 2

60348931849. 3

60348931850. 4

Question Number : 5 Question Id : 6034898473 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

_____ Spline uses concept of C^0 continuum.

_____ Spline uses concept of C^1 continuum.

1. First Degree, Second Degree
2. Second Degree, First Degree
3. Second Degree, Second Degree
4. First Degree, First Degree

Options :

60348931851. 1

60348931852. 2

60348931853. 3

60348931854. 4

Question Number : 6 Question Id : 6034898474 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Heat equation is an example of

1. Parabolic equation
2. Elliptic equation
3. Hyperbolic equation
4. None of the above

Options :

60348931855. 1

60348931856. 2

60348931857. 3

60348931858. 4

Question Number : 7 Question Id : 6034898475 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Finite Difference Method works on which of the following principle?

1. Numerical integration
2. Numerical differentiation
3. Euler method
4. Integration by parts

Options :

60348931859. 1

60348931860. 2

60348931861. 3

60348931862. 4

Question Number : 8 Question Id : 6034898476 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

For a groundwater flow modeling, which is the possible "excitation"?

1. Pumping and recharge
2. Recharge
3. Permeability
4. Pumping

Options :

60348931863. 1

60348931864. 2

60348931865. 3

60348931866. 4

Question Number : 9 Question Id : 6034898477 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

ILL-Posed problem is the one in which

1. The Boundary Conditions are not well defined
2. The Governing Equations of the system are not well defined
3. The Boundary Conditions are not well defined and also the Governing Equations of systems are not well defined
4. None of the above

Options :

60348931867. 1

60348931868. 2

60348931869. 3

60348931870. 4

Question Number : 10 Question Id : 6034898478 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In which formulation, can the unknown values be expressed directly in terms of known values?

1. Crank Nicholson
2. Fully Explicit
3. Priessmann
4. Fully Implicit

Options :

60348931871. 1

60348931872. 2

60348931873. 3

60348931874. 4

Question Number : 11 Question Id : 6034898479 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

An aquifer is bounded by a river on one side. The water levels in the river are known and are assumed to be constant during the period of study. What boundary condition does this represent?

1. Dirichlet
2. Cauchy
3. Neumann
4. None of the above

Options :

60348931875. 1

60348931876. 2

60348931877. 3

60348931878. 4

Question Number : 12 Question Id : 6034898480 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In SOR method,

1. more weightage is given to $u_{i-1,j-1}$
2. more weightage is given to $u_{i,j}$
3. $u_{i,j}$ and its surrounding points have equal weightage
4. more weightage is given to $u_{i+1,j+1}$

Options :

- 60348931879. 1
- 60348931880. 2
- 60348931881. 3
- 60348931882. 4

Question Number : 13 Question Id : 6034898481 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

With regard to the weighted residual method, which one of the following options is correct?

1. The governing equation is differentiated in the domain
2. A test function is assumed as a solution
3. The governing equation is solved directly
4. A trial function is assumed as a solution

Options :

- 60348931883. 1
- 60348931884. 2
- 60348931885. 3
- 60348931886. 4

Question Number : 14 Question Id : 6034898482 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In Boundary Element Method (BEM), a 3-D problem is solved computationally as

1. 3D problem
2. 2D problem
3. 1D problem
4. None of the above

Options :

60348931887. 1

60348931888. 2

60348931889. 3

60348931890. 4

Question Number : 15 Question Id : 6034898483 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The ratio of number of unknown terms to the number of known terms in an equation is maximum in

1. Crank Nicholson scheme
2. Implicit scheme
3. Explicit scheme
4. Same in all the above

Options :

60348931891. 1

60348931892. 2

60348931893. 3

60348931894. 4

Question Number : 16 Question Id : 6034898484 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In finite difference method, the irregular boundaries are solved by

1. Considering the irregular boundary to be regular by ignoring the irregularity
2. Taking the value at the nodes effected by the irregular boundary as an average of the value at the surrounding nodes
3. Reducing the nodal distance value at the nodes, which has the effect of irregular boundary, by some factors whose values are less than 1
4. All of the above

Options :

60348931895. 1

60348931896. 2

60348931897. 3

60348931898. 4

Question Number : 17 Question Id : 6034898485 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In Dual Reciprocity Boundary Element Method, the time component of diffusion equations is approximated as

1. Helmholtz equation
2. Poisson equation
3. Wave equation
4. Laplace equation

Options :

60348931899. 1

60348931900. 2

60348931901. 3

60348931902. 4

Question Number : 18 Question Id : 6034898486 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A : Numerical methods are used for solving engineering problems.

Reason R : Engineering problems are complex and exact solutions are limited.

In light of the above statements, choose the **correct** answer from the options given below

1. A is true and R is false
2. A is false and R is true
3. Both A and R are true and R does not explain A
4. Both A and R are true but R explains A

Options :

60348931903. 1

60348931904. 2

60348931905. 3

60348931906. 4

Question Number : 19 Question Id : 6034898487 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is NOT a meshfree approximation technique?

1. Finite volume representation
2. Integral representation
3. Series representation
4. Differential representation

Options :

60348931907. 1

60348931908. 2

60348931909. 3

60348931910. 4

Question Number : 20 Question Id : 6034898488 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following statements is **NOT** true regarding support domain?

1. Support domain has no effect on the accuracy of the meshfree method
2. Support domain is also called the influence domain
3. The support domain in a meshfree method can be of various dimensions and shapes
4. The value of shape function is considered to be zero outside support domain

Options :

60348931911. 1

60348931912. 2

60348931913. 3

60348931914. 4

Question Number : 21 Question Id : 6034898489 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In meshfree methods, the support domain is said to be locally supported because

1. The value of shape function is zero outside the support domain
2. Predefined elements are used as shape functions
3. The value of shape function is infinite outside the support domain
4. The shape of support domain can vary from node to node

Options :

60348931915. 1

60348931916. 2

60348931917. 3

60348931918. 4

Question Number : 22 Question Id : 6034898490 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following software is NOT based on BEM?

1. ParaFEM
2. FastBEM
3. MOOSE
4. AcouSTO

Options :

60348931919. 1

60348931920. 2

60348931921. 3

60348931922. 4

Question Number : 23 Question Id : 6034898491 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which one of the following statements is correct regarding the meshfree method?

1. No mesh is required in the process of integration
2. No mesh is required in the process of assembly into global matrix
3. No mesh is required in the process of interpolation
4. No mesh is required throughout the formulation and solution

Options :

60348931923. 1

60348931924. 2

60348931925. 3

60348931926. 4

Question Number : 24 Question Id : 6034898492 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which one of the following statements is INCORRECT?

1. Most commonly used support domain shapes in meshfree methods are circular and rectangular
2. Support domain is usually center at the point of interest
3. Meshfree methods are still in a developing stage
4. The main objective of boundary element method is to reduce the difficulty of meshing and remeshing

Options :

60348931927. 1

60348931928. 2

60348931929. 3

60348931930. 4

Question Number : 25 Question Id : 6034898493 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

At which of the following step does the meshfree method depart from FEM?

1. Solving the algebraic equations
2. Construction of shape function
3. Geometry creation
4. Generation of Mesh

Options :

60348931931. 1

60348931932. 2

60348931933. 3

60348931934. 4

Question Number : 26 Question Id : 6034898494 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is a strong form meshfree method?

1. Meshless Local Petrov Galerkin
2. Meshfree weak strong
3. Element free Galerkin
4. Collocation

Options :

60348931935. 1

60348931936. 2

60348931937. 3

60348931938. 4

Question Number : 27 Question Id : 6034898495 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following statements is **INCORRECT**?

1. Element free Galerkin method is a weak form meshfree method
2. Finite Volume Method is a weak strong form meshfree method
3. Finite Point Method is a strong form meshfree method
4. Boundary element method uses Green's theorem

Options :

60348931939. 1

60348931940. 2

60348931941. 3

60348931942. 4

Question Number : 28 Question Id : 6034898496 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In Meshfree method, we use

1. Nodes as well as elements
2. Elements with no nodes
3. Nodes with no elements
4. Mesh and grids

Options :

60348931943. 1

60348931944. 2

60348931945. 3

60348931946. 4

Question Number : 29 Question Id : 6034898497 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is correct regarding the Consistency of Solution?

1. The solution is stable
2. As Δx and Δt tends to zero, the finite difference form of the equation tends to the original difference equation
3. Convergence of the solution is guaranteed
4. All of the above

Options :

60348931947. 1

60348931948. 2

60348931949. 3

60348931950. 4

Question Number : 30 Question Id : 6034898498 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A: Analytical solutions are more accurate than numerical solutions.

Reason R: Numerical solutions are an approximation for the problem and have some error.

In light of the above statements, choose the **correct** answer from the options given below

1. A is true and R is false
2. A is false and R is true
3. Both A and R are true and R explains A
4. Both A and R are true but R does not explain A

Options :

60348931951. 1

60348931952. 2

60348931953. 3

60348931954. 4

Question Number : 31 Question Id : 6034898499 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is **NOT** a meshfree method?

1. Diffuse Element Method
2. Radial Point Collocation Method
3. Smoothed Particle Hydrodynamics
4. Finite Volume Method

Options :

60348931955. 1

60348931956. 2

60348931957. 3

60348931958. 4

Question Number : 32 Question Id : 6034898500 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the options is correct regarding Difference method?

1. The governing equation is integrated for approximation
2. The derivative terms and boundary conditions are replaced by difference approximation
3. The governing equation is differentiated again
4. None of the above

Options :

60348931959. 1

60348931960. 2

60348931961. 3

60348931962. 4

Question Number : 33 Question Id : 6034898501 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following curve can be used as a weight function?

1. Quadratic spline
2. Exponential
3. Cubic spline
4. All of the above

Options :

60348931963. 1

60348931964. 2

60348931965. 3

60348931966. 4

Question Number : 34 Question Id : 6034898502 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is the best suitable technique for a totally irregular domain?

1. Meshfree method
2. Finite difference method
3. Finite volume method
4. Finite element method

Options :

60348931967. 1

60348931968. 2

60348931969. 3

60348931970. 4

Question Number : 35 Question Id : 6034898503 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The objective of weighted residual method is

1. To minimize the residual
2. To make the residual zero
3. To minimize the residual at the boundary
4. To minimize the residual at the interior points

Options :

60348931971. 1

60348931972. 2

60348931973. 3

60348931974. 4

Question Number : 36 Question Id : 6034898504 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Radial Point Interpolation Method (RPIM) uses

1. Fourier basis functions
2. Polynomial basis functions
3. Radial basis functions
4. None of the above

Options :

60348931975. 1

60348931976. 2

60348931977. 3

60348931978. 4

Question Number : 37 Question Id : 6034898505 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Shooting Method is used to solve

1. Initial value problem
2. Eigenvalue problem
3. Boundary initial value problem
4. Boundary value problem

Options :

60348931979. 1

60348931980. 2

60348931981. 3

60348931982. 4

Question Number : 38 Question Id : 6034898506 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In Eulerian Approach,

1. The particles are observed in a fixed frame in space through which the particles pass
2. The particles are observed in a moving frame in space through which the particles pass
3. The particles are observed in a fixed frame in space through which the particles pass AND the particles are observed in a moving frame in space through which the particles pass
4. None of the above

Options :

60348931983. 1

60348931984. 2

60348931985. 3

60348931986. 4

Question Number : 39 Question Id : 6034898507 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

From the following, choose the correct expression for shape functions regarding linear interpolating polynomial in 1D natural co-ordinate system.

1. $L_0^{(1)} = (1 - 2\xi)/2$ and $L_1^{(1)} = (1 + 2\xi)/2$

2. $L_0^{(1)} = (1 - \xi)/2$ and $L_1^{(1)} = (1 + \xi)/2$

3. $L_0^{(1)} = 1 - \xi$ and $L_1^{(1)} = \xi$

4. $L_0^{(1)} = \xi$ and $L_1^{(1)} = 1 + \xi$

Options :

60348931987. 1

60348931988. 2

60348931989. 3

60348931990. 4

Question Number : 40 Question Id : 6034898508 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Inherent error in a given equation,

1. Represents error due to rounding off and truncation
2. Represents error of the numerical method considered in computation
3. Can be controlled through convergence studies
4. Cannot be estimated

Options :

60348931991. 1

60348931992. 2

60348931993. 3

60348931994. 4

Question Number : 41 Question Id : 6034898509 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

During which step of finite element method, Gauss Quadrature is often used?

1. Assembly of element matrices into global matrix
2. Formulation of Shape functions
3. Formulation of Constitutive Law
4. Computation of element property matrix

Options :

60348931995. 1

60348931996. 2

60348931997. 3

60348931998. 4

Question Number : 42 Question Id : 6034898510 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Following statements are made regarding rank deficit square matrix A.

- A. Inverse of A does not exist
- B. Trace of A is always 0
- C. One or more rows of A are formed using linear combinations of other rows

Choose the **correct** answer from the options given below

- 1. A and C only
- 2. B only
- 3. A only
- 4. B and C only

Options :

- 60348931999. 1
- 60348932000. 2
- 60348932001. 3
- 60348932002. 4

Question Number : 43 Question Id : 6034898511 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

How to get solution for a matrix equation $[K]_{m \times n} \{q\}_{n \times 1} = \{f\}_{m \times 1}$ when $m < n$?

- 1. Use method of least squares to approximately solve the equations
- 2. Use method of LU decomposition to solve the equations
- 3. Delete any (m-n) rows to make matrix square
- 4. Solution is not possible to obtain

Options :

- 60348932003. 1
- 60348932004. 2
- 60348932005. 3
- 60348932006. 4

Question Number : 44 Question Id : 6034898512 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Static condensation is employed for

1. Out-of-core solution
2. In-core solution
3. Formulating gradient matrix
4. Dynamic relaxation

Options :

60348932007. 1

60348932008. 2

60348932009. 3

60348932010. 4

Question Number : 45 Question Id : 6034898513 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following numerical methods has its roots in Taylor series?

1. Bisection method
2. False-position method
3. Newton-Raphson method
4. All of the above

Options :

60348932011. 1

60348932012. 2

60348932013. 3

60348932014. 4

Question Number : 46 Question Id : 6034898514 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Explicit FDM schemes are stable when

1. Peclet number ≤ 2
2. Courant number ≤ 2
3. Peclet number ≤ 1
4. Courant number ≤ 1

Options :

60348932015. 1

60348932016. 2

60348932017. 3

60348932018. 4

Question Number : 47 Question Id : 6034898515 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Find the value of D in the given equation $\begin{bmatrix} 8 & 4 \\ 2 & 6 \end{bmatrix}^{-1} = \frac{1}{D} \begin{bmatrix} 6 & -4 \\ -2 & 8 \end{bmatrix}$

1. 6
2. 22
3. 40
4. 56

Options :

60348932019. 1

60348932020. 2

60348932021. 3

60348932022. 4

Question Number : 48 Question Id : 6034898516 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Classify differential equation $u + u \sin u u_{xxxx} + u_y u_{xy} + (\sin x) u_{yyyy} + 10 = 0$.

1. 4th order non-linear non-homogeneous PDE
2. 4th order non-linear homogeneous PDE
3. 4th order quasi linear homogeneous PDE
4. 4th order quasi linear non-homogeneous PDE

Options :

60348932023. 1

60348932024. 2

60348932025. 3

60348932026. 4

Question Number : 49 Question Id : 6034898517 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

How many Gauss points are needed for the exact integration of

$$I = \int (x^7 + 2x^5 + x^2 + 40) dx ?$$

1. 4
2. 3
3. 2
4. 1

Options :

60348932027. 1

60348932028. 2

60348932029. 3

60348932030. 4

Question Number : 50 Question Id : 6034898518 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

What is the advantage of Boundary Element Method?

1. The problem of meshing and remeshing is resolved
2. Computational dimension of problem is reduced by 1
3. Computational dimension of problem is reduced by 2
4. None of the above

Options :

60348932031. 1

60348932032. 2

60348932033. 3

60348932034. 4

Sub-Section Number : 2

Sub-Section Id : 603489310

Question Shuffling Allowed : Yes

Question Number : 51 Question Id : 6034898519 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Match the models presented under Column 1 of the table to the statements under Column 2 of the table.

Column 1	Column 2
A. Numerical model	I. Relationships are represented in formulae
B. Physical Model	II. May be smaller or larger than the actual object
C. Analog Model	III. Enlargement of the prototype
D. Mathematical model	IV. Electric model for groundwater
	V. Complex problems

Choose the **correct** answer from the options given below:

1. A – V, B – II, C – IV, D – I
2. A – I, B – III, C – II, D – V
3. A – I, B – II, C – III, D – V
4. A – V, B – III, C – II, D – I

Options :

60348932035. 1

60348932036. 2

60348932037. 3

60348932038. 4

Question Number : 52 Question Id : 6034898520 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

How many Gauss points are needed in x and y directions respectively for exact integration of

$$I = \iint (x^5 + x^3y^2 - x^2y^5 + x^3y^6 - y^7) dx dy$$

1. 2 and 3
2. 3 and 4
3. 3 and 2
4. 4 and 3

Options :

60348932039. 1

60348932040. 2

60348932041. 3

60348932042. 4

Question Number : 53 Question Id : 6034898521 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following system of equations are obtained while solving $\frac{d^2y}{dx^2} + \ln y + 3y = 0$ using central difference scheme at $x = 1$ and $x = 2$. Boundary conditions are given as $y(x = 0) = 10$ and $y(x = 3) = 15$. Let $y(x = 1) = y_1$ and $y(x = 2) = y_2$.

1. $-y_1 + y_2 + \ln y_1 + 10 = 0$; $y_1 - y_2 + \ln y_2 + 15 = 0$
2. $y_1 + y_2 + \ln y_2 + 15 = 0$; $y_1 + y_2 + \ln y_1 + 10 = 0$
3. $y_1 + y_2 + \ln y_2 + 10 = 0$; $y_1 + y_2 + \ln y_1 + 15 = 0$
4. $y_1 + y_2 + \ln y_1 + 10 = 0$; $y_1 + y_2 + \ln y_2 + 15 = 0$

Options :

60348932043. 1

60348932044. 2

60348932045. 3

60348932046. 4

Question Number : 54 Question Id : 6034898522 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following statements are made for a set of two simultaneous algebraic equations, $Ax + By + C = 0$ and $Dx + Ey + F = 0$ where A, B, C, D, E and F are coefficients whereas x and y are unknowns to be determined.

A. It is a set of linear equations if A, B, C, D, E, and F are constant.

B. It is a set of homogeneous equations if C and F are a function of x as well as y and all other coefficients are constant.

C. It is a set of linear equations if B and E are a function of x and all other coefficients are constant.

D. It is a set of non-linear equations if A and D are a function of x and all other coefficients are constant.

In light of the above statements, choose the **correct** answer from the options given below

1. Statements A, B and D are correct
2. Statements A and B are correct
3. Statements A and C are correct
4. Statements A, B, C and D are correct

Options :

60348932047. 1

60348932048. 2

60348932049. 3

60348932050. 4

Question Number : 55 Question Id : 6034898523 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following statements are made with respect to BEM and FEM.

- A. BEM can be applied only when a fundamental solution is available.
- B. BEM has wider applications than FEM and can replace FEM.
- C. BEM always has a simpler numerical implementation when compared to FEM.

In light of the above statements, choose the **correct** answer from the options given below

- 1. B and C only
- 2. B only
- 3. A, B and C only
- 4. A only

Options :

- 60348932051. 1
- 60348932052. 2
- 60348932053. 3
- 60348932054. 4

Question Number : 56 Question Id : 6034898524 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Identify the correct sequence in the procedure of applying FDM.

- 1. Approximation using FDM -> Overlay grid on the problem domain -> Algebraic system of equations -> Apply boundary conditions -> Solve for unknowns
- 2. Overlay grid on the problem domain -> Approximation using FDM -> Apply boundary conditions -> Algebraic system of equations -> Solve for unknowns
- 3. Overlay grid on the problem domain -> Approximation using FDM -> Algebraic system of equations -> Apply boundary conditions -> Solve for unknowns
- 4. Overlay grid on the problem domain -> Approximation using FDM -> Algebraic system of equations -> Apply boundary conditions -> Solve for unknowns

Options :

- 60348932055. 1
- 60348932056. 2
- 60348932057. 3

60348932058. 4

Question Number : 57 Question Id : 6034898525 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which is a general solution of $v_{yy} = 2$ when $v: v(x, y)$?

1. $v = y^2 + y f(x) + g(y)$
2. $v = y^2 + f(y) + g(y)$
3. $v = y^2 + y f(x) + g(x)$
4. $v = y^2 + f(x) + x g(y)$

Options :

60348932059. 1

60348932060. 2

60348932061. 3

60348932062. 4

Question Number : 58 Question Id : 6034898526 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following statements are made regarding generalized eigenvalue problem $[A].\{q\} = \lambda.[B].\{q\}$

- A. $[B]$ can be any square matrix other than the identity matrix
- B. $[B]$ has to be an identity matrix
- C. Generalized eigenvalue problem can be converted into standard eigenvalue problem
- D. If $[A]$ and $[B]$ are symmetric matrices with real coefficients, the eigenvalues are always real

Choose the **correct** answer from the options given below

1. Statements B, C and D are correct
2. Statements A, C and D are correct
3. Only Statement A is correct
4. Only Statement B is correct

Options :

60348932063. 1

60348932064. 2

60348932065. 3

60348932066. 4

Question Number : 59 Question Id : 6034898527 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements made with respect to one-dimensional h-type Finite Element Method (FEM) and p-type FEM are correct?

A. In h-type FEM, element length is changed but the number of nodes per element is kept the same

B. In h-type FEM, element length is kept the same but the number of nodes per element is changed

C. In p-type FEM, element length is changed but the number of nodes per element is kept the same

D. In p-type FEM, element length is kept the same but the number of nodes per element is changed

Choose the **correct** answer from the options given below

1. Statements B and C are correct

2. Statements B and D are correct

3. Statements A and D are correct

4. Statements A and C are correct

Options :

60348932067. 1

60348932068. 2

60348932069. 3

60348932070. 4

Question Number : 60 Question Id : 6034898528 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Consider the data given below

$$x_0 = 0 \quad x_1 = 1 \quad x_2 = 2 \quad x_3 = 3 \quad x_4 = 4$$

$$y_0 = 1 \quad y_1 = 1.2 \quad y_2 = 1.35 \quad y_3 = 1.4 \quad y_4 = 1.42$$

What will be the values of μ_{y_2} , E_{y_1} and I_{y_3} ?

1. 1.3, 1.35, 1.4
2. 1.3, 1.3, 1.42
3. 1.3, 1.4, 1.35
4. 1.35, 1.42, 1.2

Options :

60348932071. 1

60348932072. 2

60348932073. 3

60348932074. 4

Question Number : 61 Question Id : 6034898529 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following statements are made.

Statement 1: Galerkin's Weighted Residual approach is used when solution of Differential equation is sought.

Statement 2: Variational Principle is used when solution of Integral equation is sought.

In light of the above statements, choose the **correct** answer from the options given below

1. Both Statement I and Statement II are true
2. Statement I is true, but statement II is false
3. Both Statement I and Statement II are false
4. Statement I is false, but Statement II is true

Options :

60348932075. 1

60348932076. 2

60348932077. 3

60348932078. 4

Question Number : 62 Question Id : 6034898530 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

First column consists of different divided difference schemes and second column consists of order of truncation error with respect to first derivative of a function.

List I	List II
A. First forward divided difference	I. $O(h)$
B. First backward divided difference	II. $O(h^2)$
C. First central divided difference	

Choose the correct matching option.

1. A – I, B – II, C – III
2. A – I, B – I, C – I
3. A – II, B – II, C – I
4. A – I, B – I, C – II

Options :

60348932079. 1

60348932080. 2

60348932081. 3

60348932082. 4

Question Number : 63 Question Id : 6034898531 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements regarding shape function (N_i) pertaining to the finite element method for one dimensional C^0 continuum problems are correct?

- A. $\sum N_i$ is always 1.
- B. Value of N_i is 1 for a particular node and zero at all other nodes.
- C. For a two-node bar element, shape functions are linear.

Choose the **correct** answer from the options given below

- 1. Statement A and C are correct
- 2. Statement B and C are correct
- 3. Statement A, B and C are correct
- 4. Statement A and B are correct

Options :

60348932083. 1

60348932084. 2

60348932085. 3

60348932086. 4

Question Number : 64 Question Id : 6034898532 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements made with respect to the inverse of matrices are correct?

- A. If A is a non-singular matrix, $A^{-1} = \text{Adjoint}(A)/\text{Det.}(A)$
- B. If A is a non-singular matrix, $A^{-1} = \text{Cofactor}(A)/\text{Det.}(A)$
- C. If A is a non-singular matrix, $(A^T)^{-1} = (A^{-1})^T$
- D. If A and B are non-singular matrices, $(AB)^{-1} = B^{-1}A^{-1}$

Choose the **correct** answer from the options given below

- 1. Statement A and C are correct
- 2. Statement B, C and D are correct
- 3. Statement A, C and D are correct
- 4. Only statement A is correct

Options :

- 60348932087. 1
- 60348932088. 2
- 60348932089. 3
- 60348932090. 4

Question Number : 65 Question Id : 6034898533 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

What is the approximate derivative of $f(x) = x^4$ at $x = 1$ for $h = 0.1$? Use the forward difference formula.

- 1. 4.641
- 2. 4.224
- 3. 4.411
- 4. 4.822

Options :

- 60348932091. 1
- 60348932092. 2
- 60348932093. 3
- 60348932094. 4

Question Number : 66 Question Id : 6034898534 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Solve the following differential equation by point collocation method, taking $x = 2$ and $x = 5$ as the collocation points.

$$\frac{\partial^2 y}{\partial x^2} + 3 \frac{\partial y}{\partial x} = 5x$$

Consider $y = 0$ at $x = 0$ and $x = 8$.

1. $y = (x^2 - 8x) (1.116 - 0.061x)$
2. $y = (x) (x + 8) (2 + x)$
3. $y = -(x) (x - 8) (2 + x)$
4. $y = (x - 8) (1.116 - 0.061x)$

Options :

60348932095. 1

60348932096. 2

60348932097. 3

60348932098. 4

Question Number : 67 Question Id : 6034898535 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements made regarding eigenvalues of a matrix are correct?

- A. Sum of all eigenvalues for a matrix A is determinant of A
- B. Product of all eigenvalues for a matrix A is trace of A
- C. For real symmetric matrix, eigenvalues can be complex
- D. For real unsymmetric matrix, eigenvalues are always real

Choose the **correct** answer from the options given below

- 1. Statement A and B are TRUE
- 2. All the statements are TRUE
- 3. Statement C and D are TRUE
- 4. All the statements are FALSE

Options :

60348932099. 1

60348932100. 2

60348932101. 3

60348932102. 4

Question Number : 68 Question Id : 6034898536 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following tasks are performed in Meshfree methods.

- A. Creation of support domain
- B. Domain representation
- C. Solve global Meshfree equations
- D. Formulation of system of equations
- E. Application of boundary conditions

What is the **correct** sequence of the steps in solving by Meshfree methods?

- 1. A, B, D, C, D
- 2. A, B, E, D, C
- 3. A, E, B, D, C
- 4. B, A, D, E, C

Options :

- 60348932103. 1
- 60348932104. 2
- 60348932105. 3
- 60348932106. 4

Question Number : 69 Question Id : 6034898537 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

For the data given below, find d^2y/dx^2 at $x = 0.5$ using central difference method

x	0	0.5	1
y	0	3	9

- 1. 0.8
- 2. 8
- 3. 1.2
- 4. 12

Options :

- 60348932107. 1

60348932108. 2

60348932109. 3

60348932110. 4

Question Number : 70 Question Id : 6034898538 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Evaluate $I = \int_{-1}^1 (\log_e(\log_e(10 + x))) dx$ using 1 Gauss Point.

1. 1.64792
2. -1.64792
3. -1.66806
4. 1.66806

Options :

60348932111. 1

60348932112. 2

60348932113. 3

60348932114. 4

Question Number : 71 Question Id : 6034898539 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements is **INCORRECT**?

1. Jacobi method is twice as fast as Gauss-Siedel method
2. In successive over-relaxation method, more weightage is given to the value of field variable at the current node than the value at the surrounding node
3. In the successive over-relaxation method, the value of the field variable in the next time step is taken as the sum of the value of the field variable in the current time step and the change in the value of the field variable in the next iteration of the Gauss-Siedel method
4. The accuracy of the solutions can be improved by using iterative methods

Options :

60348932115. 1

60348932116. 2

60348932117. 3

60348932118. 4

Question Number : 72 Question Id : 6034898540 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements made regarding the weak form of the weighted residual method for a DE are correct?

- A. Order of DE is lowered till the same order of differentiation for both weighing function and approximate primary variable is achieved
- B. The BCs are obtained as a part of the process while carrying out the procedure of lowering the order of DE
- C. BCs are obtained based only on the physical understanding of the given problem

Choose the **correct** answer from the options given below

- 1. Statement B and C are correct
- 2. Statement A, B and C are correct
- 3. Only statement A is correct
- 4. Statement A and B are correct

Options :

60348932119. 1

60348932120. 2

60348932121. 3

60348932122. 4

Question Number : 73 Question Id : 6034898541 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following numerical methods are used to solve Differential Equations?

- A. Point collocation method
- B. Method of least square
- C. Finite difference method
- D. Rayleigh-Ritz method

Choose the **correct** answer from the options given below

- 1. D only
- 2. A, B and C only
- 3. A and B only
- 4. A, B and D only

Options :

- 60348932123. 1
- 60348932124. 2
- 60348932125. 3
- 60348932126. 4

Question Number : 74 Question Id : 6034898542 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Given:

x	1.0	3.0	5.0	7.0
y	2	10	20	40

Fit a line $y(x) = ax + b$ and find the values of a and b.

- 1. a = 6.2 and b = -6.8
- 2. a = -6.2 and b = 6.8
- 3. a = -6.2 and b = -6.8
- 4. a = 6.2 and b = 6.8

Options :

- 60348932127. 1

60348932128. 2

60348932129. 3

60348932130. 4

Question Number : 75 Question Id : 6034898543 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Correctly match the following.

List I	List II
A. Integral Representation	I. Moving Least Square
B. Series Representation	II. General Finite Difference Method
C. Differential Representation	III. Smooth Particle Hydrodynamics

Choose the **correct** answer from the options given below:

1. A – III, B – II, C – I
2. A – I, B – II, C – III
3. A – III, B – I, C – II
4. A – II, B – III, C – I

Options :

60348932131. 1

60348932132. 2

60348932133. 3

60348932134. 4