

# National Testing Agency

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## Numerical Methods in Civil Engineering

<b>Group Number :</b>	1
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## Numerical Methods in Civil Engineering

<b>Section Id :</b>	89951415
<b>Section Number :</b>	1
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory

<b>Number of Questions :</b>	70
<b>Number of Questions to be attempted :</b>	70
<b>Section Marks :</b>	100
<b>Display Number Panel :</b>	Yes
<b>Group All Questions :</b>	Yes
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	89951424
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 1 Question Id : 8995141126 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Following two statements are made.

Statement 1: Explicit Euler's method is **unconditionally** stable.

Statement 2: Implicit Euler's method is **conditionally** stable.

State whether the statements 1 and 2 are True or False, without altering sequence of the statements.

- (a) True, True
- (b) False, False
- (c) True, False
- (d) False, True

**Options :**

- 8995144480. 1
- 8995144481. 2
- 8995144482. 3
- 8995144483. 4

**Question Number : 2 Question Id : 8995141127 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Classify differential equation  $u_{xx} + (\ln x)u_y = \sin(xy)$ .

- (a) 2<sup>nd</sup> order linear homogeneous PDE
- (b) 2<sup>nd</sup> order linear non-homogeneous PDE
- (c) 2<sup>nd</sup> order quasi linear non-homogeneous PDE
- (d) 2<sup>nd</sup> order quasi linear homogeneous PDE

**Options :**

- 8995144484. 1
- 8995144485. 2
- 8995144486. 3
- 8995144487. 4

**Question Number : 3 Question Id : 8995141128 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

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

$$I = \iint (15x^5 + 20x^3y^2 - 20x^2y^3 + 16x^3y^3 - 15y^3) dx dy$$

- (a) 2 and 3
- (b) 3 and 4
- (c) 3 and 2
- (d) 4 and 3

**Options :**

8995144488. 1

8995144489. 2

8995144490. 3

8995144491. 4

**Question Number : 4 Question Id : 8995141129 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

Average acceleration method is \_\_\_\_\_ stable and Linear acceleration method is \_\_\_\_\_ stable.

- (a) Conditionally, Unconditionally
- (b) Unconditionally, Unconditionally
- (c) Conditionally, Conditionally
- (d) Unconditionally, Conditionally

**Options :**

8995144492. 1

8995144493. 2

8995144494. 3

8995144495. 4

**Question Number : 5 Question Id : 8995141130 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

Runge-Kutta methods are primarily used to solve \_\_\_\_\_ order differential equation pertaining to \_\_\_\_\_ Value Problem.

- (a) 1<sup>st</sup>, initial
- (b) 1<sup>st</sup>, eigen
- (c) 1<sup>st</sup>, boundary
- (d) n<sup>th</sup> ( $n \geq 1$ ), boundary

**Options :**

- 8995144496. 1
- 8995144497. 2
- 8995144498. 3
- 8995144499. 4

**Question Number : 6 Question Id : 8995141131 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Choose the **correct** option regarding condition number (CN) for a function  $f(x)$ :

- (a)  $CN=1$  denotes that relative error of  $f(x)$  is identical to relative error of  $x$
- (b)  $CN>1$  denotes that small change in  $x$  causes larger change in  $f(x)$
- (c)  $CN \gg 1$  denotes that function is ill-conditioned
- (d) All of the above

**Options :**

- 8995144500. 1
- 8995144501. 2
- 8995144502. 3
- 8995144503. 4

**Question Number : 7 Question Id : 8995141132 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

First degree spline uses concept of \_\_\_\_\_ continuum and second degree spline uses concept of \_\_\_\_\_ continuum.

(a)  $C^0, C^1$

(b)  $C^1, C^0$

(c)  $C^1, C^1$

(d)  $C^0, C^0$

**Options :**

8995144504. 1

8995144505. 2

8995144506. 3

8995144507. 4

**Question Number : 8 Question Id : 8995141133 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

For a groundwater flow modelling, which is the possible “excitation”?

(a) Permeability

(b) Pumping

(c) Recharge

(d) Pumping and recharge

**Options :**



8995144508. 1

8995144509. 2

8995144510. 3

8995144511. 4

**Question Number : 9 Question Id : 8995141134 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

In Mathematical modeling, which one of the following is the best solution?

(a) Analytical solution

(b) Numerical solution

(c) Scaled model solution

(d) Semi-analytical solution

**Options :**

8995144512. 1

8995144513. 2

8995144514. 3

8995144515. 4

**Question Number : 10 Question Id : 8995141135 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

What is a Cauchy boundary condition?

- (a) Value specified
- (b) Slope specified
- (c) Both Value and Slope specified
- (d) None of the above

**Options :**

- 8995144516. 1
- 8995144517. 2
- 8995144518. 3
- 8995144519. 4

**Question Number : 11 Question Id : 8995141136 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical 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?

- (a) Dirichlet
- (b) Neumann
- (c) Cauchy
- (d) None of the above

**Options :**

8995144520. 1

8995144521. 2

8995144522. 3

8995144523. 4

**Question Number : 12 Question Id : 8995141137 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following is NOT a weighted residual method?

- (a) Galerkin method
- (b) Rayleigh Ritz method
- (c) Method of Least Squares
- (d) Method of Point Collocation

**Options :**

8995144524. 1

8995144525. 2

8995144526. 3

8995144527. 4

**Question Number : 13 Question Id : 8995141138 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Following statements are made.

- i. Well posed problem may have multiple solutions.
- ii. The discriminant of an elliptic equation is greater than 0.
- iii. If  $\Delta$  is forward difference operator,  $\nabla$  is backward difference operator and  $\delta$  is central difference operator, then,  $\Delta y_0 = \nabla y_1 = \delta y_{1/2}$ .
- iv. Taylor series is the basis for FDM.

Which of the following is correct?

- (a) Statements ii, iii and iv are correct
- (b) Only statements i and ii are correct
- (c) All statements are correct
- (d) Only statements iii and iv are correct

**Options :**

8995144528. 1
8995144529. 2
8995144530. 3
8995144531. 4

**Question Number : 14 Question Id : 8995141139 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

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

- (a) 1D problem
- (b) 2D problem
- (c) 3D problem
- (d) None of the above

**Options :**

- 8995144532. 1
- 8995144533. 2
- 8995144534. 3
- 8995144535. 4

**Question Number : 15 Question Id : 8995141140 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The BEM is based on:

- (a) Green's theorem
- (b) Taylor's theorem
- (c) Gauss method
- (d) Jacobi's theorem

**Options :**

- 8995144536. 1

8995144537. 2

8995144538. 3

8995144539. 4

**Question Number : 16 Question Id : 8995141141 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

How pumping/ recharge is considered in BEM simulation:

- (a) As distributed throughout the domain
- (b) As point source/ sink
- (c) As a boundary condition
- (d) None of the above

**Options :**

8995144540. 1

8995144541. 2

8995144542. 3

8995144543. 4

**Question Number : 17 Question Id : 8995141142 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

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

- (a) Laplace equation
- (b) Helmholtz equation
- (c) Poisson equation
- (d) Wave equation

**Options :**

- 8995144544. 1
- 8995144545. 2
- 8995144546. 3
- 8995144547. 4

**Question Number : 18 Question Id : 8995141143 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What is the advantage of Boundary Element Method?

- (a) Computational dimension of problem is reduced by 1
- (b) Computational dimension of problem is reduced by 2
- (c) The problem of meshing and remeshing is resolved
- (d) None of the above



**Options :**

- 8995144548. 1
- 8995144549. 2
- 8995144550. 3
- 8995144551. 4

**Question Number : 19 Question Id : 8995141144 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Locking and inter-connectivity is a problem in:

- (a) Finite element method
- (b) Meshfree method
- (c) Finite difference method
- (d) Boundary element method

**Options :**

- 8995144552. 1
- 8995144553. 2
- 8995144554. 3
- 8995144555. 4

**Question Number : 20 Question Id : 8995141145 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following statements is not true regarding support domain?

- (a) Support domain is also called the influence domain
- (b) The value of shape function is considered to be zero outside support domain
- (c) The support domain in a meshfree method can be of various dimensions and shapes
- (d) Support domain has no effect on the accuracy of the meshfree method

**Options :**

- 8995144556. 1
- 8995144557. 2
- 8995144558. 3
- 8995144559. 4

**Question Number : 21 Question Id : 8995141146 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In BEM, fundamental solution satisfies the governing equation at

- (a) Source point
- (b) Points inside the domain
- (c) Everywhere except source point
- (d) None

**Options :**

8995144560. 1

8995144561. 2

8995144562. 3

8995144563. 4

**Question Number : 22 Question Id : 8995141147 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Following statements are made with respect to BEM and FEM.

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

Which one of the following option depicts correct statements?

- (a) Only i
- (b) Only ii
- (c) Only ii and iii
- (d) i, ii and iii

**Options :**

8995144564. 1

8995144565. 2

8995144566. 3

8995144567. 4

**Question Number : 23 Question Id : 8995141148 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

The homogeneous and heterogeneous part of DRBEM gives, respectively, the

- (a) Indirect and direct solutions
- (b) Direct and indirect solutions
- (c) Complementary and particular solutions
- (d) Particular and complementary solutions

**Options :**

- 8995144568. 1
- 8995144569. 2
- 8995144570. 3
- 8995144571. 4

**Question Number : 24 Question Id : 8995141149 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following statements is INCORRECT?

- (a) In indirect method of BEM, the solution is obtained by super position of fundamental solutions
- (b) Indirect method uses Divergence theorem
- (c) In the indirect method, the source points are forced to satisfy the boundary conditions and the governing equation
- (d) In the direct method, the functions in the boundary integral equation has a physical implication

**Options :**

- 8995144572. 1
- 8995144573. 2
- 8995144574. 3
- 8995144575. 4

**Question Number : 25 Question Id : 8995141150 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The ideal requirement of a meshfree method is that

- (a) No mesh is required in the process of interpolation
- (b) No mesh is required in the process of integration
- (c) No mesh is required in the process of assembly into global matrix
- (d) No mesh is required throughout the formulation and solution

**Options :**

8995144576. 1

8995144577. 2

8995144578. 3

8995144579. 4

**Question Number : 26 Question Id : 8995141151 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following statements is correct?

- (a) Support domain size effects only the accuracy of the solution and not the efficiency
- (b) Support domain must be circular in shape for weak form mesh free methods
- (c) Support domain is usually centred at the point of interest
- (d) A dimensionless size of support domain of 3-4 gives good results

**Options :**

8995144580. 1  
8995144581. 2  
8995144582. 3  
8995144583. 4

**Question Number : 27 Question Id : 8995141152 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In the Moving Least Squares Method, the unknown coefficient matrix is determined by

- (a) Minimizing the L1 norm
- (b) Minimizing the L2 norm
- (c) By taking  $a = P^{-1}U$ , where  $a$  is unknown coefficient matrix,  $P$  is basis matrix,  $U$  is matrix of field variables at nodal points
- (d) By taking  $a = PU^{-1}$ , where  $a$  is unknown coefficient matrix,  $P$  is basis matrix,  $U$  is matrix of field variables at nodal points

**Options :**

8995144584. 1  
8995144585. 2  
8995144586. 3  
8995144587. 4

**Question Number : 28 Question Id : 8995141153 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**



Which of the following is a strong form meshfree method?

- (a) Element free Galerkin
- (b) Collocation
- (c) Meshless Local Petrov Galerkin
- (d) Meshfree weak strong

**Options :**

8995144588. 1

8995144589. 2

8995144590. 3

8995144591. 4

**Question Number : 29 Question Id : 8995141154 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following statements is INCORRECT?

- (a) 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
- (b) Jacobi method is twice as fast as Gauss-Siedel method
- (c) The accuracy of the solutions can be improved by using iterative methods
- (d) In 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 field variable in the next iteration of Gauss-Siedel method

**Options :**

- 8995144592. 1
- 8995144593. 2
- 8995144594. 3
- 8995144595. 4

**Question Number : 30 Question Id : 8995141155 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In Alternative Direction Implicit Scheme,

- (a) A diagonal coefficient matrix is obtained
- (b) A tridiagonal coefficient matrix is obtained
- (c) The coefficient matrix is in echelon form
- (d) The solution is not stable

**Options :**

- 8995144596. 1
- 8995144597. 2
- 8995144598. 3
- 8995144599. 4

**Question Number : 31 Question Id : 8995141156 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Consistency of solution means:

- (a) As  $\Delta x$  and  $\Delta t$  tends to zero, the finite difference form of the equation tends to the original difference equation
- (b) The solution is stable
- (c) Convergence of the solution is guaranteed
- (d) All of the above

**Options :**

- 8995144600. 1

8995144601. 2

8995144602. 3

8995144603. 4

**Question Number : 32 Question Id : 8995141157 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following software is based on Meshfree methods?

(a) ABAQUS

(b) GMS MODFLOW

(c) FreeFEM

(d) SimSolid

**Options :**

8995144604. 1

8995144605. 2

8995144606. 3

8995144607. 4

**Question Number : 33 Question Id : 8995141158 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

On substituting the fundamental solution in the governing equation, the value of the right hand side of the governing equation at the source points is

- (a) Zero
- (b) Infinity
- (c) – Infinity
- (d) Undefined

**Options :**

- 8995144608. 1
- 8995144609. 2
- 8995144610. 3
- 8995144611. 4

**Question Number : 34 Question Id : 8995141159 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In meshfree method,

- (a) Nodes must have a regular arrangement
- (b) Nodes can be taken only inside the domain
- (c) Support domain should be the same at all the nodes
- (d) Information about the relationship between the nodes is not required

**Options :**

- 8995144612. 1

8995144613. 2

8995144614. 3

8995144615. 4

**Question Number : 35 Question Id : 8995141160 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In the difference method

- (a) The derivative terms and boundary conditions are replaced by difference approximation
- (b) The governing equation is differentiated again
- (c) The governing equation is integrated for approximation
- (d) None of the above

**Options :**

8995144616. 1

8995144617. 2

8995144618. 3

8995144619. 4

**Question Number : 36 Question Id : 8995141161 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

For a 2D problem, the shape of the support domain is

- (a) Circular
- (b) Rectangular
- (c) Triangular
- (d) Any of the above

**Options :**

8995144620. 1

8995144621. 2

8995144622. 3

8995144623. 4

**Question Number : 37 Question Id : 8995141162 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is**

**Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

The objective of weighted residual method is

- (a) To make the residual zero
- (b) To minimize the residual
- (c) To minimize the residual at the boundary
- (d) To minimize the residual at the interior points

**Options :**

8995144624. 1

8995144625. 2

8995144626. 3

8995144627. 4

**Question Number : 38 Question Id : 8995141163 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Mathematically, FEM is a special case of

- (a) Collocation method
- (b) FDM
- (c) Finite volume method
- (d) Rayleigh Ritz method

**Options :**

8995144628. 1

8995144629. 2

8995144630. 3

8995144631. 4

**Question Number : 39 Question Id : 8995141164 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**



In which concept, the particles are observed in a fixed frame in space through which the particles pass?

- (a) Lagrangian concept
- (b) Eulerian concept
- (c) Both
- (d) None

**Options :**

8995144632. 1

8995144633. 2

8995144634. 3

8995144635. 4

**Question Number : 40 Question Id : 8995141165 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

In which of the following fields, can numerical models be applied?

- (a) Seismology
- (b) Fluid mechanics
- (c) Crustal dynamics
- (d) All of the above

**Options :**

8995144636. 1

8995144637. 2

8995144638. 3

8995144639. 4

**Question Number : 41 Question Id : 8995141166 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which type of solution does FDM use?

(a) Analytical

(b) Difference

(c) Integration

(d) Curve Fitting

**Options :**

8995144640. 1

8995144641. 2

8995144642. 3

8995144643. 4

**Question Number : 42 Question Id : 8995141167 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following is NOT an integration method?

- (a) Trapezoidal rule
- (b) Simpson's rule
- (c) Gauss Elimination
- (d) Gauss Quadrature

**Options :**

- 8995144644. 1
- 8995144645. 2
- 8995144646. 3
- 8995144647. 4

**Question Number : 43 Question Id : 8995141168 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following is not iterative?

- (a) Successive over relaxation
- (b) Jacobi method for implicit scheme
- (c) Trapezoidal rule
- (d) Gauss Quadrature rule

**Options :**

- 8995144648. 1
- 8995144649. 2
- 8995144650. 3

8995144651.4

**Question Number : 44 Question Id : 8995141169 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What is the value of  $\Delta y_1$ ?

- (a)  $y_1 - y_0$
- (b)  $y_2 - y_1$
- (c)  $(y_2 - y_0)/2$
- (d)  $(y_2 + y_0)/2$

**Options :**

- 8995144652.1
- 8995144653.2
- 8995144654.3
- 8995144655.4

**Question Number : 45 Question Id : 8995141170 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

A well posed problem has

- (a) Boundary conditions which are not well defined
- (b) Unique solution
- (c) Multiple solutions
- (d) Unstable solution

**Options :**

- 8995144656. 1
- 8995144657. 2
- 8995144658. 3
- 8995144659. 4

**Question Number : 46 Question Id : 8995141171 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Absolute error is 0.0012 in an approximate number 31.23420712. The number of correct digits in the given approximate number is

- (a) 7
- (b) 6
- (c) 8
- (d) 4

**Options :**

- 8995144660. 1

8995144661. 2

8995144662. 3

8995144663. 4

**Question Number : 47 Question Id : 8995141172 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Find the value of  $x$  in the given equation.

$$\begin{bmatrix} 2 & 4 \\ x & -3 \end{bmatrix} \begin{Bmatrix} 2 \\ -2 \end{Bmatrix} = \begin{Bmatrix} -4 \\ 16 \end{Bmatrix}$$

(a) 5

(b) 9

(c) -9

(d) -5

**Options :**

8995144664. 1

8995144665. 2

8995144666. 3

8995144667. 4

**Question Number : 48 Question Id : 8995141173 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Find the value of  $D$  in the given equation.

$$\begin{bmatrix} 8 & -4 \\ 2 & 6 \end{bmatrix}^{-1} = \frac{1}{D} \begin{bmatrix} 6 & 4 \\ -2 & 8 \end{bmatrix}$$

- (a) 6
- (b) 22
- (c) 40
- (d) 56

**Options :**

- 8995144668. 1
- 8995144669. 2
- 8995144670. 3
- 8995144671. 4

**Question Number : 49 Question Id : 8995141174 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What are the eigenvalues for the matrix  $\begin{bmatrix} 2 & 2 \\ 3 & 7 \end{bmatrix}$ ?

- (a) 8, 1
- (b) -8, 1
- (c) 8, -1
- (d) -8, -1

**Options :**

8995144672. 1

8995144673. 2

8995144674. 3

8995144675. 4

**Question Number : 50 Question Id : 8995141175 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

Which one the following is the Generalized eigenvalue problem?

- (a) Evaluation of Natural Frequencies
- (b) Evaluation of Principal Stresses
- (c) Evaluation of Spectral Radii
- (d) Evaluation of Principal Strains

**Options :**

8995144676. 1



8995144677. 2

8995144678. 3

8995144679. 4

**Question Number : 51 Question Id : 8995141176 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Static condensation is employed for

- (a) in-core solution
- (b) out-of-core solution
- (c) dynamic relaxation
- (d) formulating gradient matrix

**Options :**

8995144680. 1

8995144681. 2

8995144682. 3

8995144683. 4

**Question Number : 52 Question Id : 8995141177 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Following statements are made for Boundary Value Problem.

- I. It is always governed by ordinary differential equation.
- II. It always pertains to open domain.
- III. The governing differential equation is even ordered.
- IV. It pertains to steady state situation.

Which of the following option is applicable?

- (a) Only statements I and III are correct.
- (b) Only statements III and IV are correct.
- (c) Only statements I, III and IV are correct.
- (d) All statements are correct.

**Options :**

8995144684. 1

8995144685. 2

8995144686. 3

8995144687. 4

**Question Number : 53 Question Id : 8995141178 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

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

- (a) Central Difference Method
- (b) Newmark's Average Acceleration Method
- (c) Wilson- $\Theta$  Method
- (d) Implicit Euler's Method

**Options :**

- 8995144688. 1
- 8995144689. 2
- 8995144690. 3
- 8995144691. 4

**Question Number : 54 Question Id : 8995141179 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

During following step of finite element method, Gauss Quadrature is often used.

- (a) Formulation of Shape functions
- (b) Formulation of Constitutive Law
- (c) Assembly
- (d) Computation of element property matrix

**Options :**

- 8995144692. 1
- 8995144693. 2

8995144694. 3

8995144695. 4

**Question Number : 55 Question Id : 8995141180 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 1 Wrong Marks : 0**

Following methods are used to solve nonlinear algebraic equations.

- i. Initial stiffness method.
- ii. The secant method.
- iii. The false-position method.
- iv. The Newton-Raphson method.

Which of the following option is correct?

- (a) i and iii are open methods
- (b) ii and iii are open methods
- (c) i, ii and iv are open methods
- (d) All are open methods

**Options :**

8995144696. 1

8995144697. 2

8995144698. 3

8995144699. 4

**Sub-Section Number :**

**Sub-Section Id :**

89951425

**Question Shuffling Allowed :**

Yes

**Question Number : 56 Question Id : 8995141181 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical****Correct Marks : 3 Wrong Marks : 0**

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

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

Choose the correct option.

- (a) Statements ii, iii and iv are correct
- (b) Only Statement i is correct
- (c) Only Statement ii is correct
- (d) Statements i, iii and iv are correct

**Options :**

8995144700. 1

8995144701. 2

8995144702. 3

8995144703. 4

**Question Number : 57 Question Id : 8995141182 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

If  $T(x, y) = 5x^4 + 10x^3y^2 - 10x^2y^3 + 8x^2y^2 - 5y^4$ , find  $\nabla^4 T$  at (3,4).

(a) 0

(b) -124

(c) -142

(d) -176

**Options :**

8995144704. 1

8995144705. 2

8995144706. 3

8995144707. 4

**Question Number : 58 Question Id : 8995141183 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

What is the general solution of  $u_{xx} = 6x$  when  $u: u(x, y)$ ?

(a)  $u = x^3 + x.f(y) + g(y) + C$

(b)  $u = x^3 + x.f(y) + y.g(x) + C$

(c)  $u = x^3 + y.g(x) + C$

(d)  $u = x^3 + f(y) + y.g(x) + C$

**Options :**

8995144708. 1

8995144709. 2

8995144710. 3

8995144711. 4

**Question Number : 59 Question Id : 8995141184 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is**

**Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

Following statements are made for differential equation  $x^2u_{xx} + u_{yy} = e^x$

- i. Equation is parabolic for zero values of x.
- ii. Equation is hyperbolic for all values of x.
- iii. Equation is elliptic for positive values of x.
- iv. Equation is elliptic for negative values of x.

Choose the correct option.

- (a) All statements are correct
- (b) Statements i, iii and iv are correct
- (c) Statements i and iii are correct
- (d) Only Statement i is correct

**Options :**

- 8995144712. 1
- 8995144713. 2
- 8995144714. 3
- 8995144715. 4

**Question Number : 60 Question Id : 8995141185 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 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.

State whether the statements are True or False, without altering the sequence of the statements.

- (a) True, False
- (b) False, True
- (c) True, True
- (d) False, False

**Options :**

8995144716. 1

8995144717. 2

8995144718. 3

8995144719. 4

**Question Number : 61 Question Id : 8995141186 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

For the given data, what are the values of  $dy/dx$  and  $d^2y/dx^2$ , respectively, at  $x = 0.35$ ?

<b>x</b>	0.1	0.15	0.2	0.25	0.3	0.35
<b>y</b>	2.216	2.339	2.472	2.618	2.781	2.968

- (a) 13.5 and 4.03
- (b) 3.12 and 2.45
- (c) 4.03 and 13.5
- (d) 2.45 and 3.12

**Options :**

- 8995144720. 1
- 8995144721. 2
- 8995144722. 3
- 8995144723. 4

**Question Number : 62 Question Id : 8995141187 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 3 Wrong Marks : 0**

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

<b>x</b>	0	0.5	1
<b>y</b>	0	1.5	5

- (a) 0.8
- (b) 8
- (c) 1.2
- (d) 12

**Options :**

- 8995144724. 1
- 8995144725. 2
- 8995144726. 3
- 8995144727. 4

**Question Number : 63 Question Id : 8995141188 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

Followings statements are made.

- i. Meshfree methods cannot be extended to 3D problems.
- ii. Meshfree methods alleviates the locking problem.
- iii. Construction of shape function is an issue in meshfree methods.
- iv. Nodes are scattered in the problem domain and on the boundary in meshfree methods.

Which of the following option is correct?

- (a) Statements i, ii and iii are correct
- (b) Statements i and iv are correct
- (c) Statements ii, iii and iv are correct
- (d) All statements are correct

**Options :**

8995144728. 1

8995144729. 2

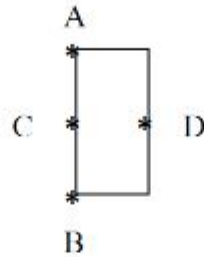
8995144730. 3

8995144731. 4

**Question Number : 64 Question Id : 8995141189 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

The boundary ACB is a Neumann boundary. The values of the parameter U are given as:



Point	U
A	100
B	0
D	45

What is the value of U at the point C?

- (a) 47.5
- (b) 55.5
- (c) 45
- (d) 48.33

**Options :**

8995144732. 1

8995144733. 2

8995144734. 3

8995144735. 4

**Question Number : 65 Question Id : 8995141190 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

The consistent load vector  $\{f\}$  for a three-node axial bar of length **3m** subjected to a uniformly distributed load of intensity **10 kN/m** is

(a)  $\{f\} = [ 10.0, 10.0, 10.0 ]^T$

(b)  $\{f\} = [ 5.0, 20.0, 5.0 ]^T$

(c)  $\{f\} = [ 7.5, 15.0, 7.5 ]^T$

(d)  $\{f\} = [ 0.0, 30.0, 0.0 ]^T$

**Options :**

8995144736. 1

8995144737. 2

8995144738. 3

8995144739. 4

**Question Number : 66 Question Id : 8995141191 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

Given:

<b>c</b>	1	3	6	9
<b>f(x)</b>	6	26	101	230

Find  $f(5)$  by using Lagrange's interpolating polynomial of third degree.

- (a) 46
- (b) 64
- (c) 68
- (d) 70

**Options :**

8995144740. 1

8995144741. 2

8995144742. 3

8995144743. 4

**Question Number : 67 Question Id : 8995141192 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is**

**Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

Given:

<b>x</b>	1.0	2.0	3.0	4.0
<b>y</b>	5	25	125	625

Fit power function  $y(x) = ax^b$  and find the values of a and b.

- (a)  $a = 1.3319$  and  $b = 3.3878$
- (b)  $a = 3.7882$  and  $b = 3.3878$
- (c)  $a = 1.4528$  and  $b = 3.7827$
- (d)  $a = 3.9127$  and  $b = 3.7827$

**Options :**

- 8995144744. 1
- 8995144745. 2
- 8995144746. 3
- 8995144747. 4

**Question Number : 68 Question Id : 8995141193 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical Correct Marks : 3 Wrong Marks : 0**



Compute the absolute and relative error in deflection  $w = PL^3/3EI$  at the tip of the cantilever beam. The beam is loaded with concentrated load  $P$  at the tip. Use the following data:

$$P^* = 500 \text{ N}; \Delta P = 10 \text{ N}$$

$$L^* = 3 \text{ m}; \Delta L = 0.1 \text{ m}$$

$$I^* = 0.08 \text{ m}^4; \Delta I = 0.0008 \text{ m}^4$$

$$E^* = 2.0 * 10^8 \text{ N/m}^2; \Delta E = 0.02 * 10^8 \text{ N/m}^2$$

- (a)  $\Delta w = 3.9375 \times 10^{-5}$  and  $\delta w = 14\%$
- (b)  $\Delta w = 3.9375 \times 10^{-6}$  and  $\delta w = 1.4\%$
- (c)  $\Delta w = 3.9375 \times 10^{-4}$  and  $\delta w = 14\%$
- (d)  $\Delta w = 3.9375 \times 10^{-7}$  and  $\delta w = 1.4\%$

**Options :**

8995144748. 1

8995144749. 2

8995144750. 3

8995144751. 4

**Question Number : 69 Question Id : 8995141194 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 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  $x = 8$ .

(a)  $y = (x)(x - 8)(2 - x)$

(b)  $y = (x^2 - 8x)(1.116 - 0.061x)$

(c)  $y = (x)(x - 8)(2 + x)$

(d)  $y = (x - 8)(1.116 - 0.061x)$

**Options :**

8995144752. 1

8995144753. 2

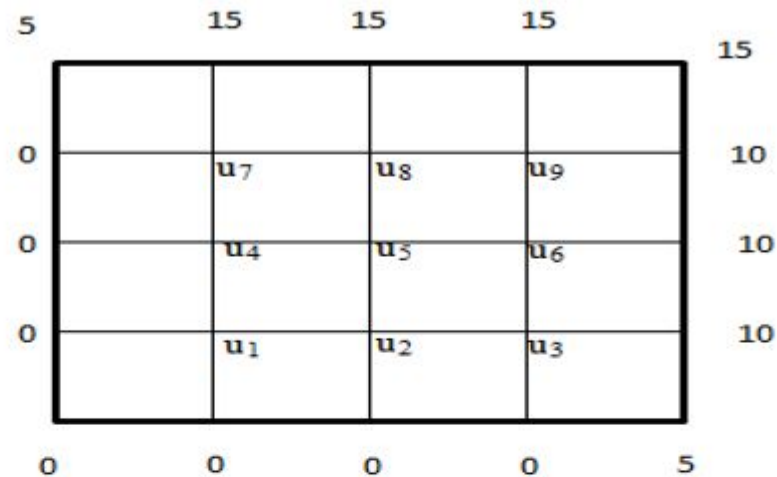
8995144754. 3

8995144755. 4

**Question Number : 70 Question Id : 8995141195 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

**Correct Marks : 3 Wrong Marks : 0**

The values of  $u_1$  through  $u_9$  and the boundary conditions are given as follows:



$u_1$	$u_2$	$u_3$	$u_4$	$u_5$	$u_6$	$u_7$	$u_8$	$u_9$
1.5625	3.28125	5.3125	3.594	6.25	8.281	6.5625	9.844	11.5625

What are the values of  $u_3$  and  $u_9$  after 1 iteration of Gauss Siedel method?

- (a) 5.3905 and 10.781
- (b) 5.31 and 11.56
- (c) 5.36 and 11.10
- (d) 5.4 and 10.82

Options :

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8995144756. 1

8995144757. 2

8995144758. 3

8995144759. 4