

National Testing Agency

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Numerical Methods in Civil Engineering

Group Number : 1
Group Id : 28860719
Group Maximum Duration : 0
Group Minimum Duration : 120
Show Attended Group? : No
Edit Attended Group? : No
Break time: 0
Group Marks: 100
Is this Group for Examiner?: No

Section 1

Section Id : 28860719
Section Number : 1
Section type : Online
Mandatory or Optional: Mandatory
Number of Questions: 55
Number of Questions to be attempted: 55
Section Marks: 55

Sub-Section Number: 1
Sub-Section Id: 28860719
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 2886071716 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Inherent error in a given equation

- (a) represents error of the numerical method considered in computation
- (b) represents error due to rounding off and truncation
- (c) can be controlled through convergence studies
- (d) cannot be estimated

Options :

2886076854. 1

2886076855. 2

2886076856. 3

2886076857. 4

Question Number : 2 Question Id : 2886071717 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

What does zero determinant of a square matrix signify?

- (a) Rows and/or columns are linearly independent vector
- (b) Matrix is non-invertible
- (c) Rows and/or columns are linearly independent vector as well as matrix is non-invertible
- (d) Given matrix equations are homogeneous.

Options :

2886076858. 1

2886076859. 2

2886076860. 3

2886076861. 4

Question Number : 3 Question Id : 2886071718 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

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

- (a) Delete any $(m-n)$ rows to make matrix square
- (b) Use method of least squares to approximately solve the equations
- (c) Use method of LU decomposition to solve the equations
- (d) Solution is not possible to obtain.

Options :

2886076862. 1

2886076863. 2

2886076864. 3

2886076865. 4

Question Number : 4 Question Id : 2886071719 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

_____ technique is used reduce the dimensionality of a large stiffness matrix.

- (a) Static condensation
- (b) Gauss elimination
- (c) LU decomposition
- (d) Method of least square

Options :

2886076866. 1

2886076867. 2

2886076868. 3

2886076869. 4

Question Number : 5 Question Id : 2886071720 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Shooting Method is used to solve _____.

- (a) Eigenvalue problem
- (b) Initial value problem
- (c) Boundary value problem
- (d) Boundary initial value problem

Options :

2886076870. 1

2886076871. 2

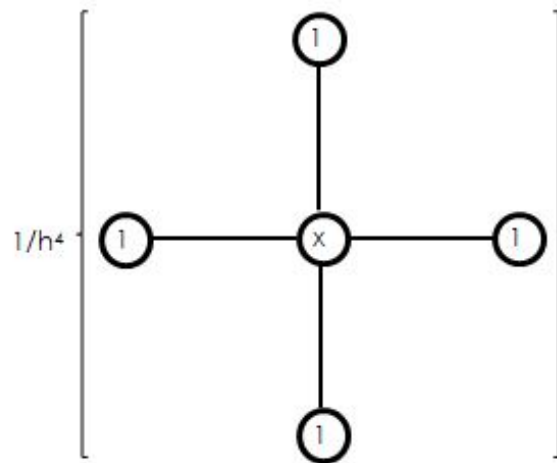
2886076872. 3

2886076873. 4

Question Number : 6 Question Id : 2886071721 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

For the partial differential equation $\frac{\partial^4 T}{\partial x^4} + \frac{\partial^4 T}{\partial y^4} + 2 \frac{\partial^4 T}{\partial x^2 \partial y^2} = 0$, the finite difference molecule for the partial differentiations is of the form:



What is the value of x?

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

Options :

2886076874. 1

2886076875. 2

2886076876. 3

2886076877. 4

Question Number : 7 Question Id : 2886071722 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

Choose the correct option regarding standard eigenvalue problem (SEVP).

- (a) SEVP is used in the determination of shear stresses for the given state of stress.
- (b) SEVP is used in the determination of octahedral stresses for the given state of stress.
- (c) SEVP is used in the determination of modes of a structure.
- (d) SEVP is used in determination of principal stresses for the given state of stress.

Options :

2886076878. 1

2886076879. 2

2886076880. 3

2886076881. 4

Question Number : 8 Question Id : 2886071723 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

For pipe network analysis, which of the model is preferred?

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

Options :

2886076882. 1

2886076883. 2

2886076884. 3

2886076885. 4

Question Number : 9 Question Id : 2886071724 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In mathematical modeling, which one of the followings is the most important step?

- (a) Sensitivity analysis
- (b) Data collection
- (c) Conceptualization
- (d) Coding

Options :

2886076886. 1

2886076887. 2

2886076888. 3

2886076889. 4

Question Number : 10 Question Id : 2886071725 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following is static formulation?

- (a) Partial differential equation
- (b) Difference equation
- (c) Algebraic equation
- (d) Integral equation

Options :

2886076890. 1

2886076891. 2

2886076892. 3

2886076893. 4

Question Number : 11 Question Id : 2886071726 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Amongst the methods mentioned below, which is the best numerical method for a totally irregular domain?

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

Options :

2886076894. 1

2886076895. 2

2886076896. 3

2886076897. 4

Question Number : 12 Question Id : 2886071727 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

For which of the following equations is the standard five-point formula applicable?

- (a) Laplace equation
- (b) Diffusion equation
- (c) Laplace as well as Diffusion equations
- (d) None of the above

Options :

2886076898. 1

2886076899. 2

2886076900. 3

2886076901. 4

Question Number : 13 Question Id : 2886071728 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following is not an explicit FDM scheme?

- (a) Four-point formula
- (b) Leap-frog formula
- (c) Priesmann formula
- (d) Upstream differencing scheme

Options :

2886076902. 1

2886076903. 2

2886076904. 3

2886076905. 4

Question Number : 14 Question Id : 2886071729 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

For a 3D problem solution using BEM, which is the preferred element?

- (a) Tetrahedron
- (b) Prism element
- (c) Triangular element
- (d) Line element

Options :

2886076906. 1

2886076907. 2

2886076908. 3

2886076909. 4

Question Number : 15 Question Id : 2886071730 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following is NOT a meshfree method?

- (a) Radial Point Collocation Method
- (b) Finite Volume Method
- (c) Finite Point Method
- (d) Smoothed Particle Hydrodynamics

Options :

2886076910. 1

2886076911. 2

2886076912. 3

2886076913. 4

Question Number : 16 Question Id : 2886071731 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In BEM simulation, the matrix is:

- (a) Tri-diagonal
- (b) Fully populated
- (c) Banded
- (d) None of the above

Options :

2886076914. 1

2886076915. 2

2886076916. 3

2886076917. 4

Question Number : 17 Question Id : 2886071732 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In Meshfree method, we use:

- (a) Only elements
- (b) Only grids
- (c) Only nodes
- (d) Mesh and grids

Options :

2886076918. 1

2886076919. 2

2886076920. 3

2886076921. 4

Question Number : 18 Question Id : 2886071733 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Smooth Particle Hydrodynamics (SPH) formulation is:

- (a) Series representation
- (b) Differential representation
- (c) Integral representation
- (d) None of the above

Options :

2886076922. 1

2886076923. 2

2886076924. 3

2886076925. 4

Question Number : 19 Question Id : 2886071734 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

For Radial Point Collocation method, which is the most suitable shape function?

- (a) Polynomial
- (b) Logarithmic
- (c) Multi-quadrics
- (d) Lagrangian

Options :

2886076926. 1

2886076927. 2

2886076928. 3

2886076929. 4

Question Number : 20 Question Id : 2886071735 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

At which step does the meshfree method depart from FEM?

- (a) Construction of shape function
- (b) Mesh creation
- (c) Geometry creation
- (d) Solving the algebraic equations

Options :

2886076930. 1

2886076931. 2

2886076932. 3

2886076933. 4

Question Number : 21 Question Id : 2886071736 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

What is the effect of the number of source points on the accuracy of the solution in BEM?

- (a) Greater the number of source points, greater is the accuracy
- (b) Greater the number of source points, lesser is the accuracy
- (c) Accuracy doesn't depend on the number of source points
- (d) Depends on the problem

Options :

2886076934. 1

2886076935. 2

2886076936. 3

2886076937. 4

Question Number : 22 Question Id : 2886071737 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In BEM, which of the elements have greater accuracy and computational cost respectively?

- (a) Linear elements, Constant elements
- (b) Linear elements, Same for both linear and constant elements
- (c) Constant elements, linear elements
- (d) Same for both linear and constant elements, Constant elements

Options :

2886076938. 1

2886076939. 2

2886076940. 3

2886076941. 4

Question Number : 23 Question Id : 2886071738 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following is not an advantage of DRBEM?

- (a) DRBEM is simple and result oriented
- (b) Discretization is done only on the boundary
- (c) Data handling is easy
- (d) Reduction in the dimensionality of the problem is greater than that in BEM

Options :

2886076942. 1

2886076943. 2

2886076944. 3

2886076945. 4

Question Number : 24 Question Id : 2886071739 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following software is NOT based on BEM?

- (a) FastBEM
- (b) ParaFEM
- (c) MOOSE
- (d) AcouSTO

Options :

2886076946. 1

2886076947. 2

2886076948. 3

2886076949. 4

Question Number : 25 Question Id : 2886071740 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following is zero outside the local support domain?

- (a) Shape function value
- (b) Field variable value
- (c) Approximate function value
- (d) All of the above

Options :

2886076950. 1

2886076951. 2

2886076952. 3

2886076953. 4

Question Number : 26 Question Id : 2886071741 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In the case of irregular distribution of nodes, the distance between two neighboring nodes while calculating the size of support domain, can be taken as:

- (a) Maximum nodal spacing
- (b) Average nodal spacing
- (c) Minimum nodal spacing
- (d) 1.5 times the average nodal spacing

Options :

2886076954. 1

2886076955. 2

2886076956. 3

2886076957. 4

Question Number : 27 Question Id : 2886071742 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which of the following is NOT a meshfree approximation technique?

- (a) Integral representation
- (b) Differential representation
- (c) Series representation
- (d) Finite volume representation

Options :

2886076958. 1

2886076959. 2

2886076960. 3

2886076961. 4

Question Number : 28 Question Id : 2886071743 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

The advantage of Radial Point Interpolation Method (RPIM) over Polynomial Point Interpolation Method (PPIM) is

- (a) The number of unknown coefficients to be determined is less in RPIM
- (b) Easy to calculate
- (c) The solution is stable and the final matrix is not singular
- (d) The computational cost is less for RPIM

Options :

2886076962. 1

2886076963. 2

2886076964. 3

2886076965. 4

Question Number : 29 Question Id : 2886071744 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

The points at the intersection of the lines dividing the domain are called

- (a) Nodal points
- (b) Mesh points
- (c) Lattice points
- (d) All of the above

Options :

2886076966. 1

2886076967. 2

2886076968. 3

2886076969. 4

Question Number : 30 Question Id : 2886071745 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

The irregular boundaries are solved using FDM by

- (a) Reducing the nodal distance value at the nodes, which has the effect of irregular boundary, by some factors whose values are less than 1
- (b) Considering the irregular boundary to be regular by ignoring the irregularity
- (c) Taking the value at the nodes effected by the irregular boundary as an average of the value at the surrounding nodes
- (d) All of the above

Options :

2886076970. 1

2886076971. 2

2886076972. 3

2886076973. 4

Question Number : 31 Question Id : 2886071746 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

If the value of field variable is taken as β (fully implicit) + $(1 - \beta)$ (fully explicit), then for the Preissman scheme, the value of β is:

- (a) 0.5
- (b) 0.6 to 0.7
- (c) 0.3 to 0.4
- (d) 1

Options :

2886076974. 1

2886076975. 2

2886076976. 3

2886076977. 4

Question Number : 32 Question Id : 2886071747 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

Explicit FDM schemes are stable when

- (a) Peclet number ≤ 1
- (b) Courant number ≤ 1
- (c) Peclet number ≤ 2
- (d) Courant number ≤ 2

Options :

2886076978. 1

2886076979. 2

2886076980. 3

2886076981. 4

Question Number : 33 Question Id : 2886071748 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In BEM, the source points are taken

- (a) On the boundary
- (b) Inside the domain
- (c) Outside the domain
- (d) Inside the domain and on the boundary

Options :

2886076982. 1

2886076983. 2

2886076984. 3

2886076985. 4

Question Number : 34 Question Id : 2886071749 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Assertion (A): The exact solutions of engineering problems are difficult to find

Reason (R): Numerical methods became a powerful tool for solving engineering problems

- (a) Both A and R are correct and R explains A
- (b) Both A and R are correct and R doesn't explain A
- (c) A is correct and R is incorrect
- (d) Both A and R are incorrect

Options :

2886076986. 1

2886076987. 2

2886076988. 3

2886076989. 4

Question Number : 35 Question Id : 2886071750 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Crank Nicholson scheme is

- (a) 40% implicit and 60% explicit
- (b) 40% explicit and 60% implicit
- (c) 50% explicit and 50% implicit
- (d) Fully implicit

Options :

2886076990. 1

2886076991. 2

2886076992. 3

2886076993. 4

Question Number : 36 Question Id : 2886071751 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Following tasks are performed in Meshfree methods.

- i. Creation of support domain
- ii. Domain representation
- iii. Solve global Meshfree equations
- iv. Formulation of system of equations
- v. Application of boundary conditions

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

- (a) i, ii, iv, iii, v
- (b) ii, i, iv, v, iii
- (c) i, ii, v, iv, v
- (d) i, v, ii, iv, iii

Options :

2886076994. 1

2886076995. 2

2886076996. 3

2886076997. 4

Question Number : 37 Question Id : 2886071752 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

In the method of weighted residuals,

- (a) The governing equation is solved directly
- (b) The governing equation is integrated in the domain
- (c) A trial function is assumed as a solution
- (d) A test function is assumed as a solution

Options :

2886076998. 1

2886076999. 2

2886077000. 3

2886077001. 4

Question Number : 38 Question Id : 2886071753 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In Galerkin's method,

- (a) Weighting functions are same as approximating functions
- (b) Trial functions have unknown adjustable values
- (c) Residual is made zero at some points in the domain
- (d) Central differencing is used

Options :

2886077002. 1

2886077003. 2

2886077004. 3

2886077005. 4

Question Number : 39 Question Id : 2886071754 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In FEM, the trial functions

- (a) Are defined over the entire domain
- (b) Have to satisfy boundary conditions
- (c) Are defined element wise
- (d) None of the above

Options :

2886077006. 1

2886077007. 2

2886077008. 3

2886077009. 4

Question Number : 40 Question Id : 2886071755 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

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

- (a) Crank Nicholson
- (b) Priessmann
- (c) Fully Implicit
- (d) Fully Explicit

Options :

2886077010. 1

2886077011. 2

2886077012. 3

2886077013. 4

Question Number : 41 Question Id : 2886071756 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

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

Column 1	Column 2
I – Numerical model II – Physical Model III – Analog Model IV – Mathematical model	i – Relationships are represented in formulae ii – May be smaller or larger than the actual object iii – Enlargement of the prototype iv – Electric model for groundwater v – Complex problems

- (a) I – i, II – ii, III – iii, IV – v
- (b) I – i, II – iii, III – ii, IV – v
- (c) I – v, II – ii, III – iv, IV – i
- (d) I – v, II – iii, III – ii, IV – i

Options :

2886077014. 1

2886077015. 2

2886077016. 3

2886077017. 4

Question Number : 42 Question Id : 2886071757 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

In fluid mechanics, for solution of Navier-Stokes equation, Plane Couette flow problem is an example of solution by

- (a) Analytical
- (b) FDM
- (c) FEM
- (d) Meshfree

Options :

2886077018. 1

2886077019. 2

2886077020. 3

2886077021. 4

Question Number : 43 Question Id : 2886071758 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Assuming an infinite sum series as a finite one results in

- (a) Truncation error
- (b) Round off error
- (c) Gross error
- (d) Systematic error

Options :

2886077022. 1

2886077023. 2

2886077024. 3

2886077025. 4

Question Number : 44 Question Id : 2886071759 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

FDM uses

- (a) Numerical differentiation
- (b) Numerical integration
- (c) Integration by parts
- (d) Euler method

Options :

2886077026. 1

2886077027. 2

2886077028. 3

2886077029. 4

Question Number : 45 Question Id : 2886071760 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

If the Newton's forward difference table is written for x_0 to x_5 , which of the following values can be obtained from the table?

- (a) $\Delta^6 x_0$
- (b) $\Delta^5 x_3$
- (c) $\Delta^5 x_0$
- (d) $\Delta^5 x_5$

Options :

2886077030. 1

2886077031. 2

2886077032. 3

2886077033. 4

Question Number : 46 Question Id : 2886071761 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

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

- (a) Determinant of matrix A is non-zero.
- (b) Unique solution exists for a system $Ax=b$.
- (c) Rows of matrix A are linearly independent.
- (d) Matrix A is rank deficit.

Options :

2886077034. 1

2886077035. 2

2886077036. 3

2886077037. 4

Question Number : 47 Question Id : 2886071762 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

Absolute error is 0.012 in an approximate number 31.23420712. The relative error is

- (a) 0.038%
- (b) 0.076%
- (c) -0.038%
- (d) -0.076%

Options :

2886077038. 1

2886077039. 2

2886077040. 3

2886077041. 4

Question Number : 48 Question Id : 2886071763 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0.5

Find the value of x in the given equation.

$$\begin{bmatrix} 2 & 4 \\ x & -3 \end{bmatrix} \begin{Bmatrix} 1 \\ -1 \end{Bmatrix} = \begin{Bmatrix} -2 \\ 15 \end{Bmatrix}$$

- (a) 5
- (b) -5
- (c) 12
- (d) -12

Options :

2886077042. 1

2886077043. 2

2886077044. 3

2886077045. 4

Question Number : 49 Question Id : 2886071764 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Find the value of D in the given equation.

$$\begin{bmatrix} 4 & -2 \\ 1 & 3 \end{bmatrix}^{-1} = \frac{1}{D} \begin{bmatrix} 3 & 2 \\ -1 & 4 \end{bmatrix}$$

- (a) 56
- (b) 14
- (c) 7
- (d) 5

Options :

2886077046. 1

2886077047. 2

2886077048. 3

2886077049. 4

Question Number : 50 Question Id : 2886071765 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Which one the following is the standard eigenvalue problem?

- (a) Evaluation of Natural Frequencies
- (b) Evaluation of Damping Parameters
- (c) Evaluation of Buckling Loads
- (d) Evaluation of Principal Stresses

Options :

2886077050. 1

2886077051. 2

2886077052. 3

2886077053. 4

Question Number : 51 Question Id : 2886071766 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Static condensation is used for

- (a) computation of eigenvalues
- (b) dynamic relaxation
- (c) sub-structuring
- (d) in-core solution

Options :

2886077054. 1

2886077055. 2

2886077056. 3

2886077057. 4

Question Number : 52 Question Id : 2886071767 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

Following statements are made for Initial Value Problem.

- I. It is governed by ordinary differential equation.
- II. It always pertains to open domain.
- III. It is always even ordered.
- IV. It is solved by marching methods.

Which of the following option is applicable?

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

Options :

2886077058. 1

2886077059. 2

2886077060. 3

2886077061. 4

Question Number : 53 Question Id : 2886071768 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

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

- (a) Central Difference Method
- (b) Newmark's Average Acceleration Method
- (c) Newmark's Linear Acceleration Method
- (d) Explicit Euler's Method

Options :

2886077062. 1

2886077063. 2

2886077064. 3

2886077065. 4

Question Number : 54 Question Id : 2886071769 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

During following step of finite element method, compatibility conditions are satisfied.

- (a) Formulation of Shape functions
- (b) Formulation of Constitutive Law
- (c) Assembly
- (d) Computation of Secondary Unknowns

Options :

2886077066. 1

2886077067. 2

2886077068. 3

2886077069. 4

Question Number : 55 Question Id : 2886071770 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0.5

What are the eigenvalues for the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$?

- (a) 5, 1
- (b) -5, 1
- (c) 5, -1
- (d) -5, -1

Options :

2886077070. 1

2886077071. 2

2886077072. 3

2886077073. 4

Section 2

Section Id :

28860720

Section Number :

2

Section type :

Online

Mandatory or Optional:	Mandatory
Number of Questions:	15
Number of Questions to be attempted:	15
Section Marks:	45

Sub-Section Number:	1
Sub-Section Id:	28860720
Question Shuffling Allowed :	Yes

**Question Number : 56 Question Id : 2886071771 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1**

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.

- i. It is a set of linear equations if A, B, C, D, E and F are constant.
- ii. 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.
- iii. It is a set of linear equations if B and E are a function of x and all other coefficients are constant.
- iv. It is a set of non-linear equations if A and D are a function of x and all other coefficients are constant.

Which of the following option is applicable?

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

Options :

2886077074. 1

2886077075. 2

2886077076. 3

2886077077. 4

**Question Number : 57 Question Id : 2886071772 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1**

Four methods are mentioned below to solve nonlinear algebraic equations.

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

Which one of the following option is correct?

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

Options :

2886077078. 1

2886077079. 2

2886077080. 3

2886077081. 4

Question Number : 58 Question Id : 2886071773 Question Type : MCQ Option Shuffling : No

Correct Marks : 3 Wrong Marks : 1

Following statements are made regarding different problems in differential equation domain.

- i. Initial value problems can be represented by ordinary differential equations.
- ii. Boundary initial value problems can be represented by ordinary differential equations
- iii. Boundary initial value problems can be represented by partial differential equations.
- iv. Eigenvalue problems are special type of boundary value problems.

Which one of the following option is correct?

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

Options :

2886077082. 1

2886077083. 2

2886077084. 3

2886077085. 4

Question Number : 59 Question Id : 2886071774 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Refer to following numerical methods.

- i. Point collocation method.
- ii. Method of least square.
- iii. Finite difference method.
- iv. Rayleigh-Ritz method.

Which of the following option applies for methods used to solve Differential Equations?

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

Options :

2886077086. 1

2886077087. 2

2886077088. 3

2886077089. 4

Question Number : 60 Question Id : 2886071775 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Following are the statements regarding shape function (N_i) pertaining to finite element method for one dimensional C^0 continuum problems.

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

Choose the correct option.

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

Options :

2886077090. 1

2886077091. 2

2886077092. 3

2886077093. 4

Question Number : 61 Question Id : 2886071776 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Following are the statements regarding partial differential equations.

- i. $\nabla^2 T = 0 \rightarrow$ Laplace's equation.
- ii. $\nabla^2 T = q \rightarrow$ Poisson's equation.
- iii. $\nabla^4 T = 0 \rightarrow$ Bi-harmonic equation.

Choose the correct option.

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

Options :

2886077094. 1

2886077095. 2

2886077096. 3

2886077097. 4

Question Number : 62 Question Id : 2886071777 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Which is the general solution of $u_{xx} = 2$ when $u: u(x,y)$?

(a) $u = x^2 + f(y) + g(x) + C$

(b) $u = x^2 + x f(y) + g(y) + C$

(c) $u = x^2 + x f(y) + g(x) + C$

(d) $u = x^2 + f(y) + y g(x) + C$

Options :

2886077098. 1

2886077099. 2

2886077100. 3

2886077101. 4

Question Number : 63 Question Id : 2886071778 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Consider the equation:

$$\frac{d^2u}{dx^2} = 2 \frac{du}{dx} + \frac{u}{2}$$

The boundary conditions are given as: $u(x = 0) = 15$ and $u(x = 10) = 10$. What is the value of u at $x = 2.5$?

(a) 5.9

(b) 8.6

(c) 9.8

(d) 10.2

Options :

2886077102. 1

2886077103. 2

2886077104. 3

2886077105. 4

Question Number : 64 Question Id : 2886071779 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Consider the data given below:

$x_0 = 0$	$x_1 = 1$	$x_2 = 2$	$x_3 = 3$	$x_4 = 4$
$y_0 = 1$	$y_1 = 1.2$	$y_2 = 1.35$	$y_3 = 1.4$	$y_4 = 1.42$

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

- (a) 1.35, 1.3, 1.42
- (b) 1.3, 1.35, 1.35
- (c) 1.3, 1.35, 1.4
- (d) 1.35, 1.42, 1

Options :

2886077106. 1

2886077107. 2

2886077108. 3

2886077109. 4

Question Number : 65 Question Id : 2886071780 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

What is the approximate derivative of $f(x) = x^2$ at $x = 1$ for $h = 0.1$? Use the forward difference formula.

- (a) 2.2
- (b) 2.05
- (c) 2
- (d) 2.1

Options :

2886077110. 1

2886077111. 2

2886077112. 3

2886077113. 4

Question Number : 66 Question Id : 2886071781 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

For an approximate number x^* , if $x^* = -32.281, \Delta x = 0.001$, what are the correct digits?

- (a) 3,2,2,8,1
- (b) 3,2,2,8
- (c) 3,2,2
- (d) 3,2

Options :

2886077114. 1

2886077115. 2

2886077116. 3

2886077117. 4

Question Number : 67 Question Id : 2886071782 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Given:

x	0.5	1.0	2.0	3.0
y	4.0	3.0	1.5	1.0

Fit exponential model $y(x) = Ae^{-0.5x}$ and find the value of A.

- (a) 4.6418
- (b) 4.7148
- (c) 4.8257
- (d) 4.0154

Options :

2886077118. 1

2886077119. 2

2886077120. 3

2886077121. 4

Question Number : 68 Question Id : 2886071783 Question Type : MCQ Option Shuffling : No
Correct Marks : 3 Wrong Marks : 1

Given:

c	1	3	6	9
f(x)	6	26	101	230

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

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

Options :

2886077122. 1

2886077123. 2

2886077124. 3

2886077125. 4

Question Number : 69 Question Id : 2886071784 Question Type : MCQ Option Shuffling : No

Correct Marks : 3 Wrong Marks : 1

The consistent load vector $\{ f \}$ for a three-node axial bar of length 3m subjected to a uniformly distributed load of intensity 5 kN/m is

- (a) $\{ f \} = [5.0, 5.0, 5.0]^T$
- (b) $\{ f \} = [2.5, 10, 2.5]^T$
- (c) $\{ f \} = [3.75, 7.5, 3.75]^T$
- (d) $\{ f \} = [0.0, 15.0, 0.0]^T$

Options :

2886077126. 1

2886077127. 2

2886077128. 3

2886077129. 4

Question Number : 70 Question Id : 2886071785 Question Type : MCQ Option Shuffling : No

Correct Marks : 3 Wrong Marks : 1

Consider the governing equation:

$$\frac{\partial^2 z(x,t)}{\partial x^2} = \frac{\partial z(x,t)}{\partial t}$$

Given: $z(x, 0) = 15$, $z(0, 5) = 25$, $z(5, 5) = 100$. Find the value of z at $(2.5, 5)$.

The solution is required to be stable.

(a) 28.25

(b) 36.11

(c) 62.50

(d) 71.98

Options :

2886077130. 1

2886077131. 2

2886077132. 3

2886077133. 4