University of Mumbai

Examination 2020 under cluster 4 (PCE)

Program: BE Mechanical Engineering
Curriculum Scheme: Rev2016
Examination: Third Year Semester VI
Course Code: MEC603 and Course Name: Finite Element Analysis

Time: 1 hour Max. Marks: 50

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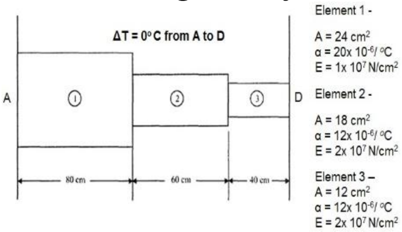
Note to the students: - All the Questions are compulsory and carry equal marks.

Q1.	Computer-aided Three-dimensional Interactive Application and Finite Element Analysis System both were developed by
Option A:	ABAQUS
Option B:	IBM
Option C:	Dassault Systems of France
Option D:	ANSYS
Q2.	Method in which residual function is taken as the weighting function is
Option A:	Galerkin method
Option B:	least square method
Option C:	collocation method
Option D:	subdomain method
Q3.	The degree of polynomial solution of a given differential equation is
Option A:	One less than the order of the differential equation
Option B:	One more than the order of the differential equation
Option C:	Equal to the order of the differential equation
Option D:	Two more than the order of the differential equation
Q4.	Weighted integral form is
Option A:	Not equal to zero
Option B:	Less than zero
Option C:	More than zero
Option D:	Equal to zero
Q5.	The shape functions of a two-node bar element are
Option A:	Linear
Option B:	Quadratic
Option C:	Constant
Option D:	Either quadratic or constant
Q6.	Dirichlet Boundary condition is
Option A:	All natural boundary conditions on secondary variables
Option B:	Mixed boundary conditions
Option C:	All essential boundary conditions on primary variables
Option D:	All natural boundary conditions on primary variables
Q7.	Stiffness matrix is a ________matrix
Option A:	Symmetric
Option B:	Diagonal

Option C:	Asymmetric
Option D:	Unit
Q8.	Degree of freedom for one-dimensional analysis of heat transfer variation of hot and cold fluids in a double pipe heat exchanger is
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q9.	The nature of loading at various locations and other surfaces conditions called
Option A:	Boundary condition
Option B:	Traction
Option C:	Friction
Option D:	Surfacing
Q10.	Which of the following is one of the convergence criteria
Option A:	The polynomial should be an incomplete polynomial
Option B:	The polynomial should be a complicated polynomial
Option C:	The polynomial should be a complete polynomial
Option D:	No polynomial required
Q11.	The secondary variable in Fluid problem is
Option A:	Pressure
Option B:	Force
Option C:	Discharge
Option D:	Time
Q12.	The matrix equation for structural analysis is
Option A:	[K][F]={U}
Option B:	{U}[K]=[F]
Option C:	[K]{U}=[F]
Option D:	[F]{U}=[K]
Q13.	Determine the Stress (in Newton per square centimeter) in element number 2, of the stepped bar shown in the figure subjected to Temperature Change. 
Option A:	0
Option B:	10
Option C:	20
Option D:	30

Q14.	For 1D linear element, natural coordinate is ξ=0.5, find the shape functions ϕ_1 and ϕ_2
Option A:	0.25, 0.75
Option B:	0.35, 0.65
Option C:	1, 0
Option D:	0, 1
Q15.	Example of 2-D element is
Option A:	Bar element
Option B:	Beam element
Option C:	Triangular element
Option D:	Brick element
Q16.	When a thin plate is subjected to loading in its own plane only, the condition is called _________ condition.
Option A:	Plane stress
Option B:	Plane strain
Option C:	Zero stress
Option D:	Zero strain
Q17.	Higher order Serendipity elements are obtained by:
Option A:	Adding external nodes only
Option B:	Adding internal nodes only
Option C:	Adding both internal and external nodes
Option D:	Without adding nodes
Q18.	In 3 node triangular element, ϕ_1= 0.25 and ϕ_3=0.25 then value of ϕ_2
Option A:	0
Option B:	1
Option C:	0.5
Option D:	-0.5
Q19.	The total potential energy of an elastic body is defined as ________
Option A:	Strain energy - Work potential
Option B:	Strain energy + Work potential
Option C:	Strain energy + Kinetic energy - Work potential
Option D:	Strain energy + Kinetic energy + Work potential
Q20.	Dimension of Jacobian matrix for 2D quadrilateral element is
Option A:	2x1
Option B:	1x2
Option C:	2x2
Option D:	4x4
Q21.	The dimension of the Stress-Strain Relation (D) matrix for 2D stress analysis is
Option A:	1x1
Option B:	1x3

Option C:	3x1
Option D:	3x3
Q22.	In 2D stress analysis, the shear strain in
Option A:	$\frac{\delta u}{\delta y}$
Option B:	$\frac{\delta v}{\delta x}$
Option C:	$\frac{\delta u}{\delta y}+\frac{\delta v}{\delta x}$
Option D:	$\frac{\delta u}{\delta x}+\frac{\delta v}{\delta y}$
Q23.	Analysis that deals with the determination of natural frequency is
Option A:	Structural Analysis
Option B:	Thermal Analysis
Option C:	Modal Analysis
Option D:	Kinematic Analysis
Q24.	Lumped Mass Matrices for transverse vibration of beam is given by,
Option A:	$\frac{\rho Al}{2}\begin{bmatrix}1&0&0&0\\0&1&0&0\\0&0&1&0\\0&0&0&1\end{bmatrix}$
Option B:	$\frac{\rho Al}{2}\begin{bmatrix}1&0&1&0\\0&0&0&0\\1&0&1&0\\0&0&0&0\end{bmatrix}$
Option C:	$\frac{\rho Al}{2}\begin{bmatrix}1&0&0&0\\0&0&0&0\\0&0&0&0\\0&0&0&1\end{bmatrix}$
Option D:	$\frac{\rho Al}{2}\begin{bmatrix}1&0&0&0\\0&0&0&0\\0&0&1&0\\0&0&0&0\end{bmatrix}$
Q25.	Natural Frequency of axial vibration of bar (E = 200GPa, ρ = 7800 kg/m^3, L=1 m) fixed at one end using lumped mass matrices using one linear element is given by
Option A:	7161.51 rad
Option B:	8159.94 rad
Option C:	7751.26 rad
Option D:	8770.58 rad

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Question	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	B
Q3.	B
Q4	D
Q5	A
Q6	C
Q7	A
Q8.	B
Q9.	A
Q10.	C
Q11.	C
Q12.	C
Q13.	A
Q14.	A
Q15.	C
Q16.	A
Q17.	A
Q18.	C
Q19.	B
Q20.	C
Q21.	D
Q22.	C
Q23.	C
Q24.	D
Q25.	A