University of Mumbai

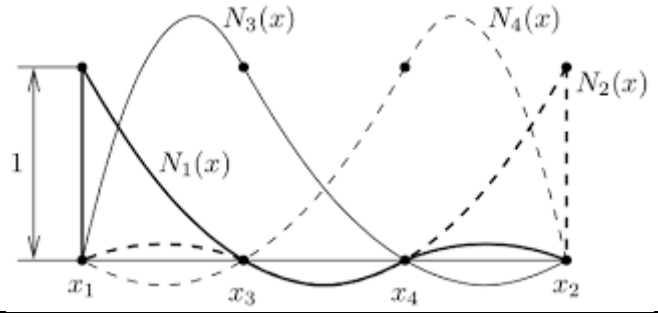
Examination 2020 under cluster 4 (PCE)

Program: BE Mechanical Engineering
Curriculum Scheme: Rev2012
Examination: Third Year Semester VI
Course Code: MEC606 and Course Name: Finite Element Analysis

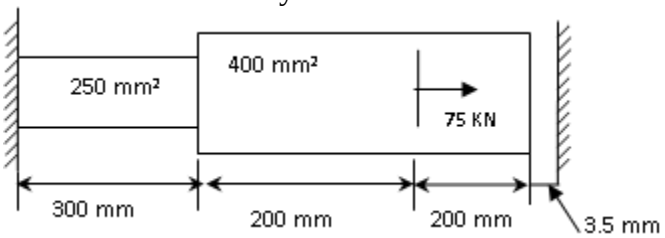
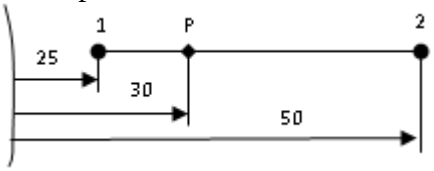
Time: 1 hour Max. Marks: 50

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

Q1.	The weight function of Galerkin method to solve a differential equation is
Option A:	Coefficients of constants in dependent variable
Option B:	1
Option C:	Any polynomial expression
Option D:	-1
Q2.	In the given differential equation , u'(3) = 5, is a $-\frac{d}{dx}\left[(x-1)\frac{du}{dx}\right]=x^2;3\le x\le 5$ u(5)=10 and u'(3)=5
Option A:	Essential Boundary Condition
Option B:	Dirichlet boundary condition
Option C:	Homogeneous boundary condition
Option D:	Natural Boundary Condition
Q3.	The order of given differential equation is $-\frac{d}{dx}\left[(x-1)\frac{du}{dx}\right]=x^2;3\le x\le 5$
Option A:	0
Option B:	1
Option C:	2
Option D:	3
Q4.	The degree of given differential equation is $-\frac{d}{dx}\left[(x-1)\frac{du}{dx}\right]=x^2;3\le x\le 5$
Option A:	0
Option B:	1
Option C:	2
Option D:	3
Q5.	In the given differential equation , the primary variable is $-\frac{d}{dx}\left[(x-1)\frac{du}{dx}\right]=x^2;3\le x\le 5$
Option A:	x
Option B:	u
Option C:	d/dx
Option D:	du/dx

Q6.	The shape function N1 at point with local coordinate 4 units for a 1D linear element of length 10 units is
Option A:	0.6
Option B:	0.4
Option C:	-0.6
Option D:	-0.4
Q7.	The governing equation for vertical bar is
Option A:	$\frac{d}{dx}\left[EA\frac{du}{dx}\right]+f=0$
Option B:	$\frac{d}{dx}\left[EA\frac{du}{dx}\right]=1$
Option C:	$\frac{d}{dx}\left[EA\frac{du}{dx}\right]-f=0$
Option D:	$\frac{d}{dx}\left[EA\frac{du}{dx}\right]=0$
Q8.	Which statement is not true for Global stiffness matrix
Option A:	Square matrix
Option B:	Symmetric matrix
Option C:	Singular Matrix
Option D:	Size of matrix depends on no. of nodes
Q9.	The variation of shape function as shown in the figure is for 
Option A:	1D linear element
Option B:	1D quadratic element
Option C:	1D cubic element
Option D:	1D constant element
Q10.	Beam element is an
Option A:	1D element with 1DOF
Option B:	1D element with 2DOF
Option C:	2D element with1 DOF
Option D:	2D element with 2DOF
Q11.	The [B] matrix for 1D linear element is
Option A:	$\frac{1}{L}[-1 \quad 1]$

Option B:	$\frac{E}{L}[-1 \quad 1]$
Option C:	$\frac{1}{L}[1 \quad -1]$
Option D:	$\frac{E}{L}[1 \quad -1]$
Q12.	In weighted Residual technique, the residue is
Option A:	Minimized
Option B:	Maximized
Option C:	Kept constant
Option D:	Kept varying
Q13.	No. of nodes in 1D quadratic element is
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q14.	The value of natural coordinate varies from
Option A:	-1 to 2
Option B:	0 to 1
Option C:	1 to 2
Option D:	-1 to 1
Q15.	A 2D quadrilateral element with 4 nodes is a
Option A:	Linear quadrilateral element
Option B:	Quadratic quadrilateral element
Option C:	Cubic quadrilateral element
Option D:	Constant quadrilateral element
Q16.	The criteria for the polynomial function to attain convergence is
Option A:	The polynomial should be continuous and complete
Option B:	The polynomial should be continuous and incomplete
Option C:	The polynomial may or may not be continuous but complete
Option D:	The polynomial may or may not be complete but continuous
Q17.	The B matrix for a CST element is of order
Option A:	6x6
Option B:	3x3
Option C:	3x6
Option D:	6x3
Q18.	The Stress-Strain Relation (D) Matrix for Plane Stress Condition is

Option A:	$\frac{E}{1-\nu^2}\begin{bmatrix} 1 & \nu & 0 \\ \nu & 1 & 0 \\ 0 & 0 & \frac{1-\nu}{2} \end{bmatrix}$
Option B:	$\frac{E}{1-\nu^2}\begin{bmatrix} 1 & \nu & 0 \\ \nu & 1 & 0 \\ 0 & 0 & \frac{1-2\nu}{2} \end{bmatrix}$
Option C:	$\frac{E}{(1+\nu)(1-2\nu)}\begin{bmatrix} 1-\nu & \nu & 0 \\ \nu & 1-\nu & 0 \\ 0 & 0 & \frac{1-2\nu}{2} \end{bmatrix}$
Option D:	$\frac{E}{(1+\nu)(1-2\nu)}\begin{bmatrix} 1-\nu & \nu & 0 \\ \nu & 1-\nu & 0 \\ 0 & 0 & \frac{1-\nu}{2} \end{bmatrix}$
Q19.	The matrix that gives the relationship between two coordinate system is
Option A:	Displacement Matrix
Option B:	Jacobian Matrix
Option C:	Load Matrix
Option D:	Directional matrix
Q20.	The size of the global stiffness matrix with minimum number of nodes for the system shown below for a 1D analysis is 
Option A:	3x3
Option B:	4x4
Option C:	5x5
Option D:	6x6
Q21.	The linear shape function at point P is 

Option A:	0.1,0.9
Option B:	0.2,0.8
Option C:	0.3,0.7
Option D:	0.4,0.6
Q22.	The Governing equation for free axial vibration of rod is given by
Option A:	$A\,E\frac{\partial^2 y}{\partial x^2} = \rho\,A\,\frac{\partial^2 t}{\partial t^2}$
Option B:	$\frac{1}{AE}\frac{\partial^2 y}{\partial x^2} = \rho\,A\,\frac{\partial^2 t}{\partial t^2}$
Option C:	$AE\frac{\partial^2 y}{\partial x^2} = \frac{1}{\rho\,A}\,\frac{\partial^2 t}{\partial t^2}$
Option D:	$\frac{1}{AE}\frac{\partial^2 y}{\partial x^2} = \frac{1}{\rho\,A}\,\frac{\partial^2 t}{\partial t^2}$
Q23.	Analysis to determine natural frequency is
Option A:	Structural Analysis
Option B:	Thermal Analysis
Option C:	Fluid Analysis
Option D:	Modal Analysis
Q24.	Which of the element is a 2D element
Option A:	Bar Element
Option B:	Link Element
Option C:	CST Element
Option D:	Brick Element
Q25.	The coordinated in natural coordinate system is denoted by
Option A:	x, y
Option B:	$\bar{x}$, $\bar{y}$
Option C:	ξ, η
Option D:	r, θ

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