Total No. of Questions : 12]

SEAT No. :

P1153

[Total No. of Pages : 3

[4659] - 24

B.E. Civil Engineering (Semester - II)

A : FINITE ELEMENT METHOD IN CIVIL ENGINEERING (Elective - IV)

(2008 Pattern) (Open Elective)

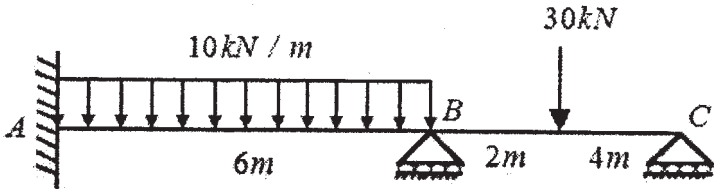
Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate books.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

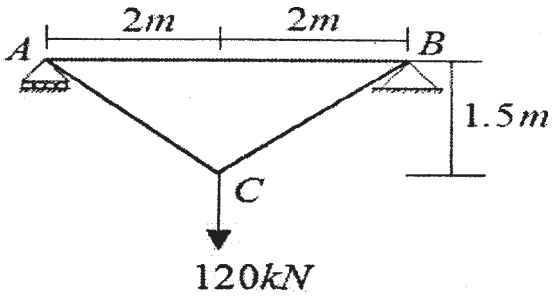
SECTION - I

Q1) Analyse the beam using stiffness matrix method (member approach) if support B is sink by 25mm. Take El = 3800 kN.m^2. **[18]**



OR

Q2) Analyze the truss and find member forces. Cross-sectional area of members are AB=1000 mm^2, BC=800 mm^2, CA = 800 mm^2. Take E = 2 × 10^5 MPa **[18]**



Q3) Develop stiffness matrix for two noded frame element with three degrees of freedom at each node. Take EI constant. **[16]**

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OR

Q4) Develop stiffness matrix for two noded grid Element with three degrees of freedom at each node. Take EI and GJ constant. **[16]**

Q5) a) Derive the differential equations of equilibrium for 3D elasticity problem. **[8]**

b) Derive Saint Venant's strain compatibility conditions. **[8]**

OR

Q6) a) Write stress strain relationship for plane stress, plane strain and axisymmetric problems. **[8]**

b) Derive strain-displacement relations for 3D elasticity problem in Cartesian coordinate system. **[8]**

SECTION - II

Q7) a) Write short note on 2D and 3D Pascale's triangle. **[9]**

b) State and explain principle of virtual work and minimum potential energy. **[9]**

OR

Q8) a) Explain step by step procedure for finite element method. **[9]**

b) What is effective node numbering scheme. Explain with example. **[9]**

Q9) a) State the convergence criteria for the choice of the displacement function in FEM. **[8]**

b) Explain in brief discretization with suitable example. **[8]**

OR

Q10)a) Explain local, global and natural coordinate systems. **[6]**

b) Derive stiffness matrix of two noded bar element using principle of minimum potential energy. **[10]**

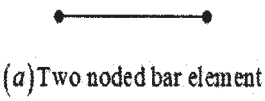
Q11) Derive shape functions of following isoparametric elements in natural coordinate system (ζ, η). **[16]**

a) Two noded bar element

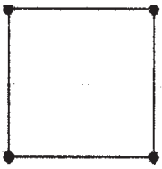
b) Four noded rectangular element

c) Eight noded rectangular element

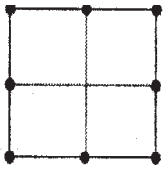
d) Nine noded rectangular element



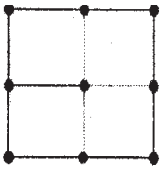
(*a*) Two noded bar element



(*b*) Four noded rectangular element



(c) Eight noded rectangular element



(*d*) Nine noded rectangular element

OR

Q12) Derive necessary matrices [A], [B] and [D] for formulation of stiffness matrix of three noded axisymmetric triangular element. **[16]**

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