Total No. of Printed Pages:2

SUBJECT CODE NO:- K-8022
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Oct/Nov 2016
Finite Element Method
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

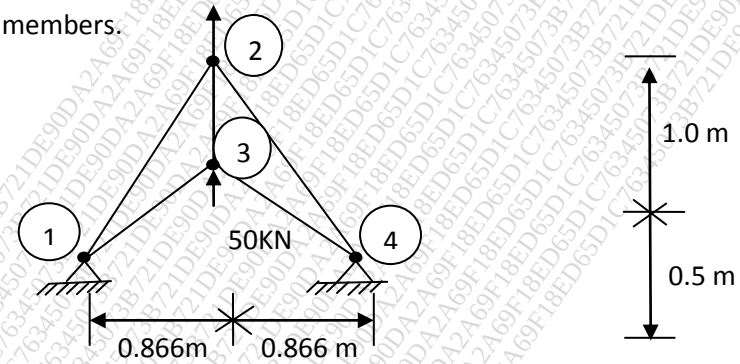
Please check whether you have got the right question paper.

N.B i) Solve any two questions from Section A and Section B each.
ii) Use of Non Programmable calculations is permitted.
iii) Assume suitable additional data if required and state it clearly.

Section A

Q.1 a) Explain stepwise procedure adopted in finite element method of analysis. 14
b) Explain various fields of application of finite element method of analysis. 06

Q.2 Analyse the two dimensional truss structures as shown in figure no. 1, using finite element method. 20
Find defection at nodes 2 and 3 and forces in all the members. Area of cross section of all members is same and $E = 2x10^4\ kN/cm^2$ For all members.



Figures No. 1

Q.3 a) Derive the stiffness matrix for triangular plane stress element. 10
b) Explain in detail plane stress and plane strain problems with suitable examples. Mention linear constitutive relations for the same. 10

Section – B

Q.4 Explain isoperimetric element concept in relation with FEM. Define sub parametric & super parametric elements. Explain advantages of isoperimetric element formulation in FEM. 20

Q.5 Using the direct stiffness method, assemble the structure stiffness matrix for a continuum compressing of two triangular elements as shown in figure 2. Assume single degree of freedom at each node and the element stiffness matrices for two elements as given below. 20

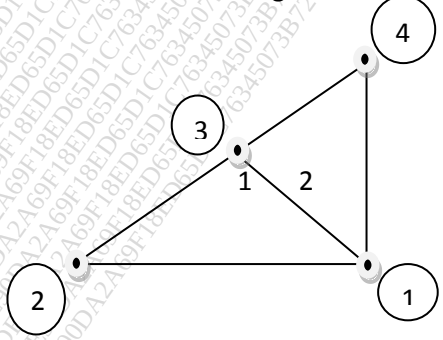


Figure 2

$$[K]_1 = \begin{bmatrix} 4 & -2 & 2 \\ -2 & 4 & 3 \\ 2 & 3 & 8 \end{bmatrix}$$

$$[K]_2 = \begin{bmatrix} 2 & 4 & 3 \\ 4 & 4 & -2 \\ 3 & -2 & 5 \end{bmatrix}$$

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Q.6 Write short notes on: (Any four) 20

a) Constant strain triangle
b) Convergence criteria
c) Serendipity elements
d) Minimisation of band width of final equations
e) Axisymmetric problems in structural mechanics

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SUBJECT CODE NO:- K-8145
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Oct/Nov 2016
Theory of Elasticity & Plasticity
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Attempt any two questions from section A and any two questions from section B
2. Assume suitable data if required.

Section A

Q.1 a) Derive the equation for the deviatoric principal stresses in terms of the general stress components σ_{ij}. Hence obtain deviatoric stress invariants J_1, J_2 and J_3 reduce them in terms of principal stresses. 15

b) Explain the difference in the approach of Elasticity and that of strength of material. 05

Q.2 a) Derive the equations of equilibrium in two dimensions in terms of polar co-ordinates. 10

b) Investigate what problem of plane stress is satisfied by the stress function. 10

$$\phi = \frac{3F}{4a}\left(xz - \frac{xz^3}{3d^2}\right) + \frac{p}{2}Z^2$$

Applied to the region included in z=0, z=d, x=0 on the side x positive. Show the variation of σ_x, σ_z and z_{xz}

Q.3 A square bar of side 'a' is subjected to torque T. obtain expression for stress and displacement at any point. 20

Section B

Q.4 a) Explain the assumptions made in plastic flow (stress-strain relationship) mathematically and enlist the different flow rules in plasticity. 10

b) Define yield criteria and yield surface in plasticity. Give mathematical formulation of yield surfaces of Tresca and von- mises and draw figures of three surfaces. 10

Q.5 The state of stress at a point in a material is given by 20
σ_x = 70Mpa, σy=120Mpa, σxy=35Mpa
If the yield strength of the material is 125Mpa determined in a uniaxial tension test. Find whether yielding will occur according to Tresca's or von-mises yield criteria or not?

Q.6 The plane state of stress at a point is given by σ_x= 70Mpa, σy=140Mpa, Z_{xy}=-35Mpa. If the yield stress is 175MP_4 determine whether material will yield according to Tresca condition or von-mises yield condition. 20

2016

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SUBJECT CODE NO:- K-8163
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Oct/Nov 2016
Advanced Structural Mechanics -I
(Revised)

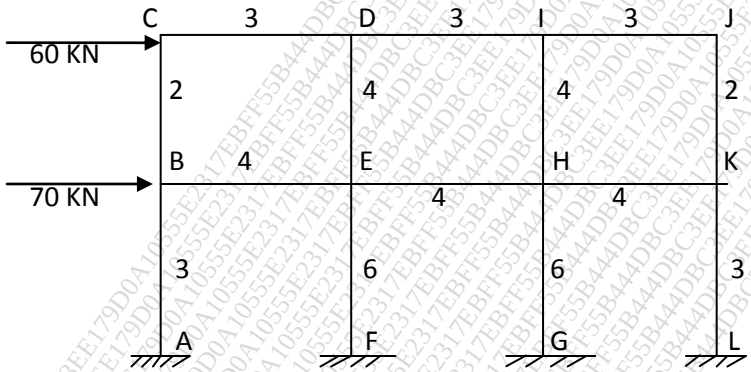
[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

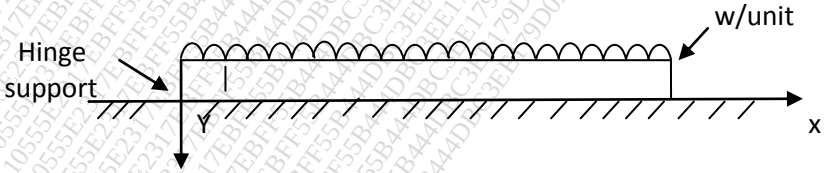
N.B i) Solve any two questions from each section.
ii) Assume suitable data if required & state it clearly.

Section A

Q.1 Analyse the following frame by using principle of multiple. Draw BMD. 20



Q.2 Derive the equation of foundation pressure equation of slope, Bending moment shear force & deflection for the long beam subjected to self weight 20

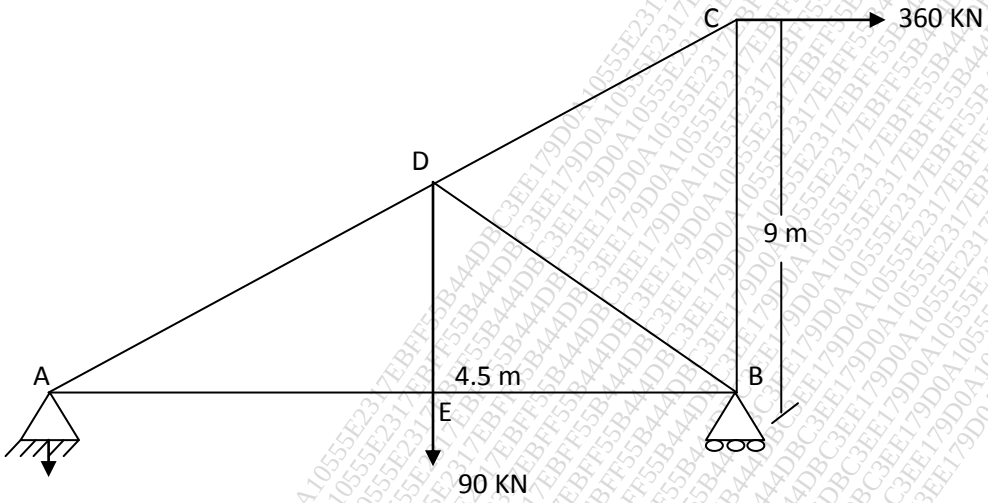


Q.3 a) Differentiate straight beam & beam curved in plan with respect to analysis & design. 05
b) Draw the bending moment diagram & twisting moment diagram for a semicircular beam in plan, supported at three supports symmetrically carrying udl wKN/m run over entire span. 15

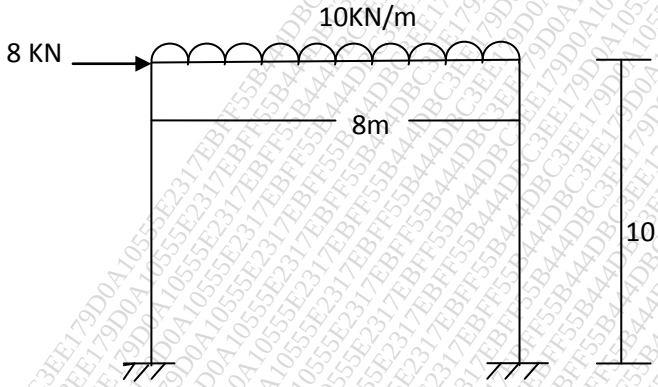
Section B

Q.4 Compute the secondary stresses in all members of the truss with rigid joints shown in fig, the c/s area is 2500 mm^2 & E = $2x10^5$ N/mm^2, MI for each section. MI = $6x10^6$ mm^4 & depth for all sections is 150mm 20

2016



Q.5 20



Solve by minimum weight design.

Q.6
a) Differentiate skew bridge & straight bridge with respect to analysis & design. 10
b) Stepwise procedure to analyse the generalized grid structure. 05
c) Explain minimum weight design of plane frame. 05

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SUBJECT CODE NO:- K-8182
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Oct/Nov 2016
Advanced Concrete Technology
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1) Attempt any two questions from each section.
2) Use of IS-10262-1984, 2009, ACI-211.1, ACI=211.4 is allowed.
3) Use if non –programmable calculator is allowed.
4) Assume suitable data if required and state it clearly.

Section- A

Q.1	a)	Explain compatibility of super-plasticizer with cement.	07
	b)	Explain new generation super-plasticizers.	07
	c)	Explain factors affecting amount of air entrainment.	06
Q.2	a)	Explain different methods of determining modulus of elasticity of concrete.	08
	b)	Explain Abram's law of water/ cement ratio.	04
	c)	Explain effect of fly ash on hardened concrete.	08
Q.3	a)	Explain Design steps of IS-10262-1984 for concrete mix proportioning.	08
	b)	Differentiate between IS 10262-2009, ACI 211 and DOE method.	08
	c)	Explain the concept of Rheblogy of concrete.	04

Section-B

Q.4	a)	Explain different test conducted on self- compacting concrete to measure it flow ability.	08
	b)	Explain viscosity modifying Agent.	04
	c)	Explain production and placing of self compacting concrete.	08
Q.5	a)	Explain characteristics of high performance concrete.	08
	b)	Explain applications of high performance concrete in practice.	08
	c)	Explain advantages and disadvantages of fiber reinforced concrete.	04
Q.6	a)	Explain different types of fibres used in fibre reinforced concrete.	08
	b)	Explain structural behaviour of fiber reinforced concrete.	04
	c)	Derive the expression for moment of resistance of reinforced concrete with fibres.	08

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SUBJECT CODE NO:- K-8201

FACULTY OF ENGINEERING AND TECHNOLOGY

M.E. (Structural Engg.) Examination Oct/Nov 2016

Numerical Methods

(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B i) Solve any two from each section.

Section A

Q.1 a) Explain Gauss elimination method. 05

b) Solve the equation by Gauss seidel method. 15

$10x_1 - 2x_2 - x_3 - x_4 = 3$

$-2x_1 + 10x_2 - x_3 - x_4 = 15$

$-x_1 - x_2 + 10x_3 - 2x_4 = 27$

$-x_1 - x_2 - 2x_3 + 10x_4 = -9$

Q.2 a) Explain LU-Decomposition method. 05

b) Use Newton Raphson method to find root of equations. 15

1) $x^2 - 2x - 5 = 0$ ii) $x^3 - 5x + 3 = 0$

Q.3 a) Explain Newton's polynomial method. 05

b) Fit a curve of the form. 15

$y = ab^x$ to the following data

X	1	2	3	4	5	6
y	151	100	61	50	20	8

Section – B

Q.4 a) Explain Trapezoidal & composite Trapezoidal Rule. 05

b) Evaluate the integral 15

$I = \int_0^1 \frac{dx}{1+x}$ using

Composite Trapezoidal rule with 2, 4 & 8 equal subintervals.

Q.5 a) Given $\frac{dy}{dx} = y - x$ where $y(0) = 2$, find $y(0.1)$ & $y(0.2)$ correct to find four decimal place using Range-kutta second order method. 10

b) Given the initial value problem $U' = t^2 + u^2, \quad u(0) = 0$ 10

Determine the first three non zero terms in the Taylor series for $U(t)$ & hence obtain the value for $U(1)$.

2016

Q.6 a) Determine the largest Eigen value & the corresponding Eigen vector by power method. 10

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$

10

b) Using the shooting method, solve the first boundary value problem.
$U'' = U + 1, 0 < x < 1$
$u(0) = 0, u(1) = e - 1$
Use Euler-Cauchy method with h=0.25 to solve the resulting system of first order initial value problems.

Total No. of Printed Pages:1

SUBJECT CODE NO:- K-8235
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Structural Engg.) Examination Oct/Nov 2016
El-1-Advanced Design of Concrete Structure
(Revised)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i. Solve any two questions from the following each section.
ii. Use IS 456, 1343, 1893, 3370 are slowed.

Section A

Q.1
a) Design a simply supported rectangular. Slab of $4.5m \times 5.5m$ to carry a service load of 8KN/m^2. Use M20 grade of concrete & Fe415 grade of steel. 10
b) Explain types of priestess concrete pipes & show the typical L – section of non – cylinder prestess concrete pipes & cylindrical pipes 10

Q.2 A cylindrical silo has an internal diameter of 9m with the height of cylindrical portion being20mt. The material stored is wheat with density of 8.5KN/m^3. The coefficient of friction between wall & material is 0.45. The angle of repose of the material is 28°. The ratio of horizontal to vertical pressure is 0.40. Use M25 & Fe415 grades. Design reinforcements required for silo walls & the bottom of the cylindrical portion of the silo by using Jansen's theory. 20

Q.3 An R. C. Chimney having a mean diameter of 2.5m is reinforced with sixty bars of 16mm diameters. Assuming an effective wind pressure of 1.5KN/m^2.on projected area, determine the maximum stresses in concrete and steel at a section 25 metres from the top. Use M20 and Fe250 grades. 20

Section B

Q.4
a) What are the advantages of partially prestressed pretensioned poles? 10
b) Discuss the stepwise design of composite section. 10

Q.5 A prestressed concrete tank of diameter 20 meters has to resist an internal pressure head of 5mt. Of water. Find the reinforcement required per metre height and the thickness of concrete required. Provide a factor of safety of1.5 at which the stress in concrete at transfer = 17.5 N/mm^2 .stress in steel at transfer = 1050 N/mm^2. Stress in steel in steel at working condition 850N/mm^2. Stress in steel at working condition 850N/mm^2 & m =8. 20

Q.6
a) State the assumptions in the design of silos by Janssen's theory. 03
b) What are the Indian code provisions for moment redistribution in pressurised concrete continuous beams? 07
c) Design an electric pole 14m high to support wire's at its top which can exert a reversible horizontal force of 5KN. The tendons are initially stressed to loss of stress due to shrinkage & creep is 15% .Compressive stress in concrete shall be limited to 15KN/mm^2 10