Hall Ticket Number :										

R14

Code: 4PEC14

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Computational Methods

(Common to Machine Design & Structural Engineering)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1. Solve the non-linear equations $x^2 + y^2 = 4$, $x^2 + y^2 = 16$ numerically with $x0 = y0 = 2.828$ using Newton-Raphson method perform two iterations. 12M

OR

2. Derive the formula for Simpson's $\frac{3}{8}$ rule and evaluate $\int_0^\infty e^{-x^2} dx$ by taking seven ordinates. 12M

UNIT-II

3. Explain Cubic Spline method to solve a boundary value problem. Use Cubic -Spline method to find $y(1.5)$ satisfying the differential equation $x^2y'' + xy' - y = 0$ with $y(1) = 1, y(2) = 0.5$. 12M

OR

4. Solve Laplace's equation with $h = \frac{1}{3}$ over the boundary of a square unit length with $u(x,y) = 9x^2y^2$ on the boundary. 12M

UNIT-III

5. Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ subject to the following conditions $u(0,t) = 0$, $u(1,t) = 0, t > 0$ and $\frac{\partial u}{\partial t}(x,0) = 0, u(x,0) = sin^3(\pi x)$ $for\ all\ 0 \le x \le 1.$ 12M

OR

6. Solve the boundary-value problem $u_t = 4u_{xx}$ subject to the conditions $u(0,t) = 0 = u(4,t), \frac{\partial u(x,0)}{\partial t} = 0, u(x,0) = 4x - x^2$ with $h = 1, k = 0.5$ 12M

UNIT-IV

7. Obtain the solution of the boundary-value problem defined by $\frac{d^2y}{dx^2} = -2$, $0 < x < 1; y(0) = 0, y'(1) = 0$ Taking two equal subintervals by using Galerkin-Technique. 12M

OR

8. Explain about the Applications to Two-Dimensional problems. 12M

UNIT-V

9. Write about 2D-plots and 3D-plots, input / output in MATLAB. 12M

OR

10. Write a MATLAB program to solve simultaneous system of linear equations numerically by Gauss -elimination method. 12M

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Hall Ticket Number :										

R14

Code: 4PT611

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Matrix Methods of Structural Analysis

(Structural Engineering)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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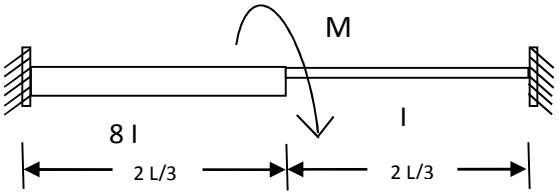
UNIT–I

1. a) Explain the following
   i. Principle of minimum potential energy
   ii. Principle of minimum complementary energy 6M

   b) Form the system stiffness matrix [K] for the given beam



6M

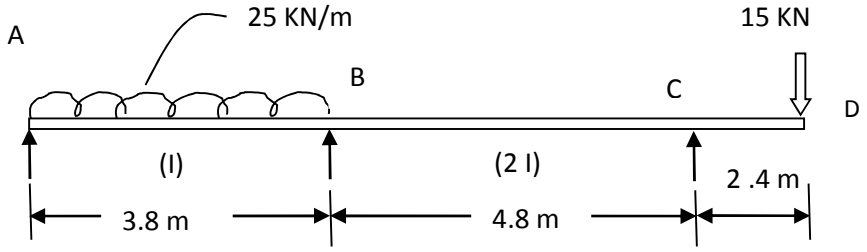
OR

2. a) i. Explain geometric and material non linearity.
   ii. Define static indeterminacy and kinematic indeterminacy? 6M

   b Explain the force and displacement methods for analysis of structures. 6M

UNIT–II

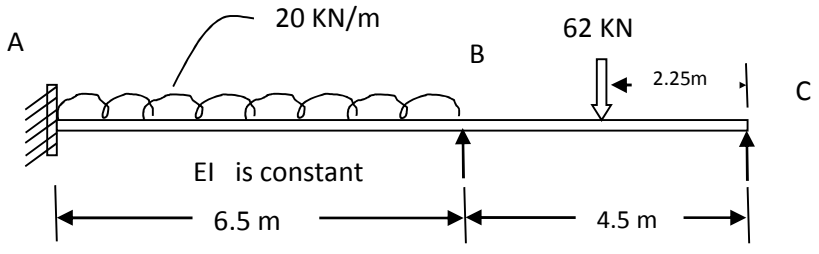
3. Analyze the beam shown by flexibility method. Draw the bending moment diagram.



12M

OR

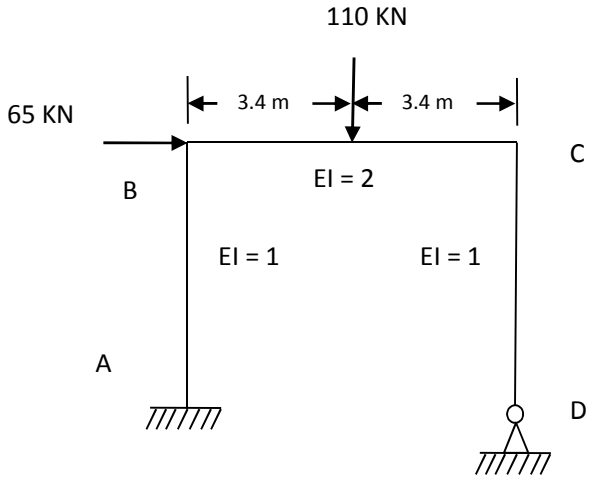
4. Analyze the beam shown below by stiffness method. Draw the bending moment diagram and elastic curve of the beam.



12M

UNIT–III

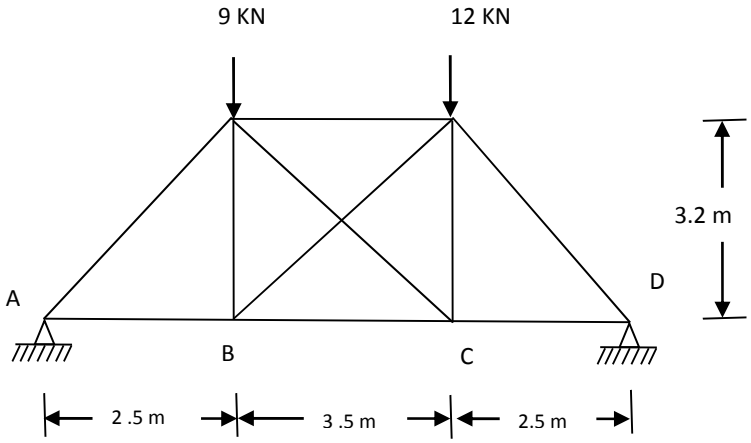
5. Analysis the frame shown below by stiffness method



12M

OR

6. Analyze the truss shown in figure by flexibility method and find forces in all the members. Take A= 780 mm^2 for all the members and E as 200 kN/mm^2



12M

UNIT–IV

7. a) Explain sub structuring techniques for the analysis of framed structure and also define force transformation matrix 6M

   b) Derive global stiffness matrix for a space truss member 6M

OR

8. a) Explain static condensation technique and structure & element coordinates with example. 6M

   b) Derive global stiffness matrix for a rigid plane frame member 6M

UNIT–V

9. a) Explain Skyline storage and also define Eigen value and Eigen vector 6M

   b) What is banded and sparse matrix and explain their necessity for matrix analysis 6M

OR

10. a) Explain Cholesky method with an example and how it differs with Gauss elimination method. 6M

    b) Write a note on direct inversion method. 6M

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Hall Ticket Number :										

R14

Code: 4PT612

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Theory of Elasticity

(Structural Engineering)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1. a) Obtain the equations of Equilibrium in three dimensions, from first principles.

   b) The distribution of stresses in the bending of a rectangular section is as follows. Check whether the equilibrium conditions are satisfied in the absence of body forces.

$$\tau_{xy} = \tau_{xz} = \sigma_z = 0$$

$$\sigma_x = \frac{12}{h^3}\left(M_o + \frac{ql^2}{8} - \frac{qh^3}{20}\right)y - \frac{4qx^3y}{h^3} + \frac{5qy^2}{h^3}$$

$$\sigma_y = -\frac{5q}{h^3}\left(\frac{y^3}{3} - \frac{h^2y}{4} + \frac{h^3}{12}\right)$$

$$\tau_{yz} = -\frac{6q}{h^3}\left(\frac{h^2}{4} - y^3\right)x$$

OR

2. a) Briefly explain the Plane Stress and Plane Strain with examples.

   b) Derive the governing differential equation for a Plane Stress problem using Stress function approach.

UNIT-II

3. Obtain a solution for stresses in narrow cantilever beam with a load at the free end, using a 4^{th} degree polynomial for the stress function. Hence obtain the strains in the beam.

OR

4. Obtain a solution for stresses in a simply supported beam subjected to Uniformly Distributed Load, using a stress function. Hence obtain the strains in the beam.

UNIT-III

5. Derive the differential equation of equilibrium in Polar coordinates for two dimensional problems of elasticity. Apply a general solution of it to the bending of curved bar to get stresses and displacements in bar.

OR

6. a) Obtain the solution for bending of a curved bar by a force at the end.

   b) Obtain the stress-strain relations using polar coordinates.

UNIT-IV

7. Determine the principal stresses and the principal planes for the stress at a point

$$[S]=\begin{bmatrix} 0.5 & 1.0 & 0.8 \\ 1.0 & 0.7 & 1.2 \\ 0.8 & 1.2 & 0.6 \end{bmatrix}$$

OR

8. The following strains have been measured at a point on the surface of a body

Direction	Angle(α)	Strain
1	0°	0.004
2	120°	0.003
3	240°	-0.005

Determine the principal strains and the principal directions of strains.

UNIT-V

9. Derive the solution for torsion of a prismatic bar. Also obtain the solution for an elliptic cross-section.

OR

10. Explain membrane analogy. Apply this to the problem of torsion of a bar with narrow rectangular cross-section.

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Hall Ticket Number :										

R14

Code: 4PT613

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Theory and Analysis of Plates

(Structural Engineering)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT–I

1. a) Derive the differential equation for the cylindrical bending of plates. 6M

   b) From first principles, obtain the expression for deflection for a uniformly loaded rectangular plate with simply supported edge. 6M

OR

2. Explain the levy's solution for the symmetrical bending of laterally loaded circular plates. 12M

UNIT–II

3. Derive the differential equation for the symmetrical bending of laterally loaded circular plates. 12M

OR

4. Derive the deflection equation for a circular plate concentrically loaded. 12M

UNIT–III

5. Derive the differential equation of the deflection surface of plates under simultaneous bending and stretching. 12M

OR

6. Explain the differential equation for the bending of rectangular plates subjected to simultaneous action of lateral loads and in-plane forces. 12M

UNIT–IV

7. Derive from first principles, the fourth order governing differential equation for bending of Orthotropic Plates. 12M

OR

8. Analyze a grid floor by applying theory of thin plates to orthotropic plates 12M

UNIT–V

9. Calculate the deflection of simply supported rectangular plates by strain energy method. 12M

OR

10. Explain about the application finite difference equations to the bending of simply supported plates. 12M

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Hall Ticket Number :										

R14

Code: 4PT615

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Advanced Reinforced Concrete Design

(Structural Engineering)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1. What is meant by short term and long term deflections? Explain briefly about the calculation of deflections using different methods. 12M

OR

2. Estimate the deflection of a cantilever beam of breadth 300 mm and overall depth 600 mm, span of 5.0 m subjected to a maximum bending moment due to characteristic live and dead loads are 200 kNm of which 50% due to permanent loads. Assume suitable data if required. 12M

UNIT-II

3. a) What are the steps involving in designing deep beams? 4M
   b) Explain the design procedure of deep beams by using ACI method. 8M

OR

4. A reinforced concrete deep girder is continuous over spans of 8.0 m apart, from centre to centre. It is 4.0 m depth, 300 mm thick and the supports are columns of size 900 mm in width. If the girder supports a uniformly distributed load of 200 kN/m including its own weight, design the necessary steel assume M-20 grade and Fe-415 grade steel. 12M

UNIT-III

5. Explain shear due to unbalanced moments? And also the combined effect of shear and torsional moments? 12M

OR

6. A flat slab of 7 x 6 m panels on 500 x 500 mm columns has a slab thickness of 180 mm, designed for a total characteristic load (liveload and deadload) 9.3 kN/m^2. Check the safety of slab by using M-20 grade concrete and Fe-415 grade steel. Assume any data if required. 12M

UNIT-IV

7. Write the step by step design procedure for rectangular and flanged shear walls. 12M

OR

8. A bar bell type shear wall with central part 3500 x 150 mm and 400 x 400 mm strong bands at each end is supported on a footing 8 m x 4 m, which rests on soil whose modulus is 30,000 kN/m^3. Determine the lateral stiffness of the wall using M-20 grade concrete and Fe-415 grade steel and the height of wall is 13.0 m. 12M

UNIT-V

9. Explain briefly on effect of high temperatures on different types of structural members. 12M

OR

10. Estimate the loss in bending strength of a beam subjected to a standard fire. The beam is 600 x 350 mm in size with 6 No.'s of 16 mm diameter rods placed in one row with a side and bottom clear cover to main steel of 40 mm. Assume M-20 grade concrete and Fe-415 grade steel. 12M

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Hall Ticket Number :										

R14

Code: 4PT618

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Maintenance & Rehabilitation of Structures

(Structural Engineering)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1 Describe the different facets of maintenance operations required for water retaining structures. 12M

OR

2. Give your recommendations to overcome the deficiency in flexural strength of a beam, with sketches. 12M

UNIT-II

3 Explain the role of polymers in repair of structures. 12M

OR

4. Outline the techniques of rehabilitating the leakage and spalling of concrete in water tanks. 12M

UNIT-III

5. List the different types of structural distresses observed in steel and masonry structures. Explain. 12M

OR

6. Discuss about durability properties of repair materials. 12M

UNIT-IV

7. Write short notes on
   i) Shoring and Underpinning 6M
   ii) Vacuum concrete 6M

OR

8. Write short notes on
   i) Gunite and shortcrete 6M
   ii) Expansive cement 6M

UNIT-V

9. Write a case study on structure that is severely affected along with its rehabilitation involved to repair the distress. 12M

OR

10. Write a case study on marine structure that is severely affected along with its rehabilitation involved to repair the distress 12M

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