Hall Ticket Number :										

R14

Code: 4PT615

M.Tech. I Semester Regular & Supplementary Examinations January 2017

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. Compare the methods of determining the deflections by IS 456 and BS8110. 12M

OR

2. Explain the factors affecting crack width in RC beams and explain the mechanism of flexural cracking. 12M

UNIT–II

3. Explain the method of detailing of deep beams. Explain the steps involved in the design of deep beams according to British practice. 12M

OR

4. A continuous deep beam spanning over three equal spans of 8m each has an overall depth of 4m. The width of support is 0.8m and the width of beam is 0.4m. The beam supports a uniformly distributed live load of 160 kN/m. Using M20 grade concrete and Fe 415 grade steel, design suitable reinforcements for the central span of the continuous deep beam. Sketch the details of reinforcements. 12M

UNIT–III

5. Explain the method of calculating punching shear stress in column supported slab systems. 12M

OR

6. Design a flat slab to cover a room of internal dimensions 6m X 9m and 200 mm slab thickness. Assume M20 grade concrete and Fe 415 steel. Assume that the slab corners are free to lift up. Assume a live load of 3 kN/m^2 and a finish load of 1 kN/m^2 12M

UNIT–IV

7. Design a braced reinforced concrete wall of height 3.5m and height 4m to carry 400 kN per metre length of wall. Assume grade 20 concrete and Fe 415 steel. 12M

OR

8. Explain the principles of design of a slender reinforced concrete wall to carry vertical load. 12M

UNIT–V

9. Discuss the effects of high temperature on steel and concrete in detail. 12M

OR

10. Explain the steps involved in the determination of the ultimate bending moment capacity of RC beams under fire. 12M

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Hall Ticket Number :										

R14

Code: 4PEC14

M.Tech. I Semester Regular & Supplementary Examinations January 2017

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. The system of equations $x^2y+y^2=10$; $xy^2+x^2=3$ has a solution near x=0.8 and y=2.2. Perform two iterations by Newton's method to obtain the root 12M

OR

2. Compute the value of $I=\int_0^1 \frac{dx}{1+x^2}$ using the trapezoidal rule with h=0.5, 0.25 and 0.125. Then obtain a better estimate using Romberg's method. 12M

UNIT–II

3. Give the boundary value problem $x^2y''+xy'-y=0,\ y(1)=1,\ y(2)=0.5$, apply the cubic spline method to determine the value of y(1.5). 12M

OR

4. Solve $\nabla^2 u=-10\left(x^2+y^2+10\right)$ over the square mesh with sides x=0, y=0, z=3, y=3 with u=0 on the boundary and mesh length 1 unit. 12M

UNIT–III

5. Given the differential equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ and the boundary conditions u(0)=u(5, t)=0 and $u(x,0)=25x^2-x^4$. Take h= 1 and k = ½ 12M

OR

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

UNIT–IV

7. Solve the boundary value problem defined by $y^{11}-x=0$, and $y(0)=0$, $y^1(1)=-1/2$ by the Rayleigh Ritz method. 12M

OR

8. Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=k, 0 \prec x, y \le 1$ with u=0 on the boundary C of the region S. 12M

UNIT–V

9. a) Write a short notes on 2D plots in MATLAB 6M

   b) Discuss about script files in MATLAB 6M

OR

10. Write a MATLAB programme 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 January 2017

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) What are the differences between static indeterminacy and kinematic indeterminacy 6M

   b) Explain the concept of structural Idealization and derive the relation between the force and displacement for a truss member. 6M

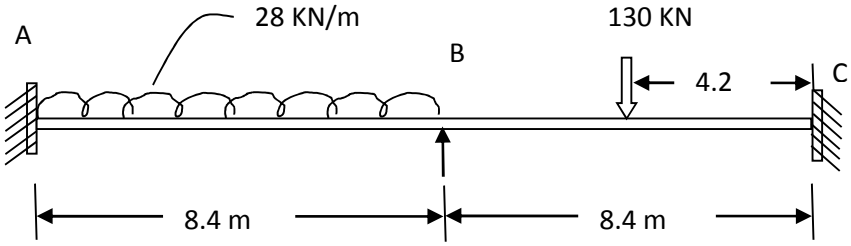
OR

2. a) Discuss equilibrium and compatibility conditions for flexural members 6M

   b) Discuss the concept of flexibility and stiffness with the help of example 6M

UNIT–II

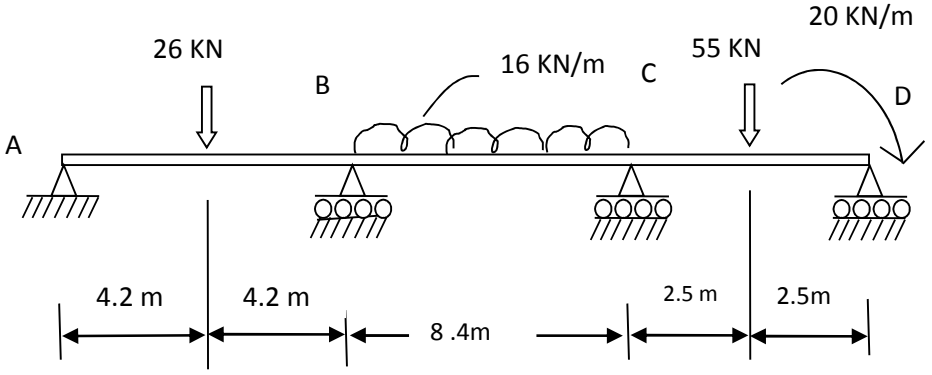
3. Analysis the continuous beam shown below by flexibility method. Take EI is constant for two spans.



12M

OR

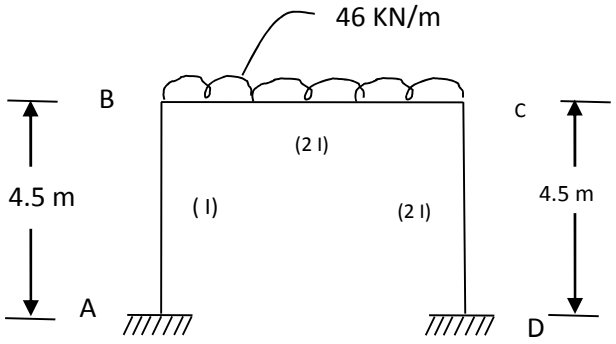
4. Analysis the continuous beam in figure below by stiffness method. Take EI is constant for all spans.



12M

UNIT–III

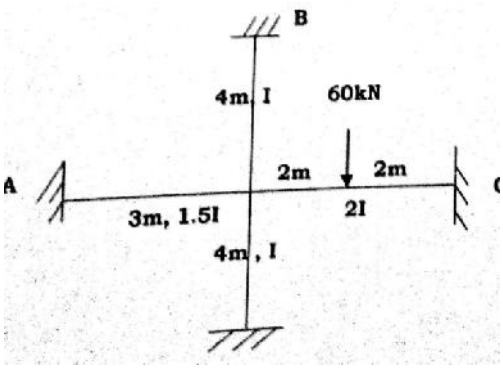
5. Analyze the frame by flexibility method and draw BMD and SFDs



12M

OR

6. Analyze the rigid jointed frame shown below by stiffness method.



12M

UNIT–IV

7. a) Explain briefly the procedure for static condensation technique 6M

   b) Explain sub structuring techniques for the analysis of structural systems 6M

OR

8. a) Explain the local and global co-ordinate systems 6M

   b) Develop the member stiffness matrix of a plane truss member in global coordinates 6M

UNIT–V

9. a) Define band width of matrix and what do you understand from frontal solver. 6M

   b) Write a note on Cholesky method 6M

OR

10. a) What is sparse and banded matrix and explain how they are useful in matrix analysis approach. 6M

    b) Explain Gauss elimination method with an example. 6M

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Hall Ticket Number :										

R14

Code: 4PT618

M.Tech. I Semester Regular & Supplementary Examinations January 2017

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. a) Why quality assurance for structure is needed? List out the components of quality assurance for building and explain it in detail.
   b) Discuss in detail about the thermal properties of concrete. Explain how concrete structure is affected by thermal condition.

OR

2. a) Elaborately explain about the effect of temperature on concrete
   b) Analyse the various methods of corrosion in protection of rebar.

UNIT–II

3. a) Differentiate between repair and maintenance of building, also list out the causes which necessitate the maintenance.
   b) List out the various types of maintenance operations and explain it in detail.

OR

4. a) Illustrate the different types of maintenance to the structural elements
   b) With the flow chart analyse the steps involved in the assessment procedure for evaluate damages in a structure and to carry out rehabilitation work.

UNIT–III

5. a) Discuss the types of polymer concrete composites with their advantages.
   b) Describe the following type of concrete
      i. High performance concrete
      ii. Sulphur infiltrated concrete

OR

6. a) Describe in detail about the reactive powder concrete. And also write a note on polymer impregnated concrete.
   b) With respect to fibre reinforced concrete explain aspect ratio and volume fraction. Also explain their effects on fresh and hardened concrete properties. Explain with its stress-strain curve.

UNIT–IV

7. a) Identify the Non-destructive testing equipments and describe in detail.
   b) Write notes on the following terms with its applications:
      (i) Shortcreting
      (ii) Gunite

OR

8. a) State the purpose of underpinning and explain its method with neat sketch.
   b) Integrate the features of dry pack and mortar pack with neat sketches.

UNIT–V

9. a) Write note on Case study on patch repair in RCC slab.
   b) How do you repair a structure distressed due to corrosion. Explain in detail.

OR

10. a) State and explain the various options for strengthening a concrete with low member strength.
    b) How do you strengthen a heavily corroded RCC beam in structure

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Hall Ticket Number :										

R14

Code: 4PT613

M.Tech. I Semester Regular & Supplementary Examinations January 2017

Theory & 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 simply supported rectangular plate of dimension a x b x h is subjected to load 'P' acting over an area uv. Derive the expression for deflection. Adopt Navier's approach.

OR

2. Find Levy's solution for simply supported and uniformly loaded rectangular plates.

UNIT–II

3. Obtain the expression for deflection in case of uniformly loaded circular plates with clamped edges.

OR

4. Derive the differential equation for deflection for the symmetrical bending of a circular plate with lateral loads of the type.

$$\frac{d^3w}{dr^3}+\frac{1}{r}\frac{d^2w}{dr^2}-\frac{1}{r^2}\frac{dw}{dr}=\frac{Q}{D}$$

Where Q = total shear force on the plate = $\int_0^r qrdr$, q = intensity of lateral loading , r = radius , D = Flexural rigidity of the plate.

UNIT–III

5 Write the differential equation of the deflection surface of plates under simultaneous bending and stretching and explain the same by taking a simple case?

OR

6 Explain the theory of rectangular plates with simply supported edges under the combined action of uniform tension and uniform lateral load?

UNIT–IV

7 List the properties of orthotropic plates and derive the governing equation for the Orthotropic plates?

OR

8 Explain the concept of Grid work system in case of Orthotropic plates and explain the same by taking a simple case?

UNIT–V

9 Derive the plate equation in finite difference form and modify the plate equation so as to apply it on a boundary with free edge.

OR

10 Derive the expression for total strain energy in a plate.

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Hall Ticket Number :										

R14

Code: 4PT612

M.Tech. I Semester Regular & Supplementary Examinations January 2017

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) Define stress at a point. Show the stress tensor for 3 dimensional case and explain the notation used

   b) Prove that stress tensor is a symmetric second order tensor.

OR

2. Find out the principal stresses for the following stress tensor

$$\begin{bmatrix} 100 & 200 & 50 \\ 200 & 150 & 100 \\ 50 & 100 & 200 \end{bmatrix} \text{MPa}$$

UNIT–II

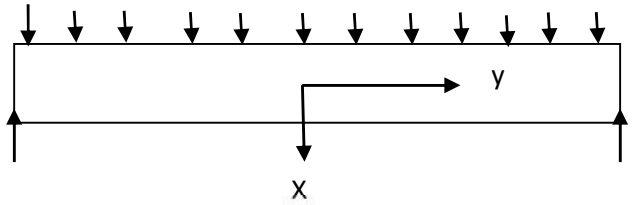
3. a) State and explain the Saint Venant's principle .

   b) Find out what problem of plane stress is solved by the following stress function.

$$\emptyset = \frac{3F}{C}\left(xy - \frac{xy^3}{3C^2}\right) + \frac{P}{2}y^2$$

OR

4. On a simply supported beam of narrow rectangular cross section a uniform distributed load of intensity 'q' is applied as shown in the figure. The thickness of the beam is '2C'



Prove that the stress distribution in the beam is given by

$$\sigma_x = \frac{3q}{4C^3}\left(x^2y - \frac{2}{3}y^3\right)$$

$$\sigma_y = \frac{3q}{4C^3}\left(\frac{1}{3}y^3 - C^2y + \frac{2}{3}C^3\right)$$

$$\tau_{xy} = \frac{-3q}{4C^3}(C^2 - y^2)$$

UNIT–III

5. Prove that the general equation in polar coordinates as

$$\left(\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}+\frac{1}{r^2}\frac{\partial^2}{\partial \theta^2}\right)\left(\frac{\partial^2 \phi}{\partial r^2}+\frac{1}{r}\frac{\partial \phi}{\partial r}+\frac{1}{r^2}\frac{\partial^2 \phi}{\partial \theta^2}\right)=0$$

   Where ϕ is the stress function of 'r' and θ

OR

6. Prove the strain components in two dimensional polar coordinate system are

$$\varepsilon_r = \frac{\partial u}{\partial r}$$

$$\varepsilon_\theta = \frac{u}{r}+\frac{\partial v}{r\partial \theta}$$

$$\gamma_{r\theta} = \frac{v}{r}\frac{\partial v}{\partial r}+\frac{\partial u}{r\partial \theta}$$

   Where 'u' and 'v' are displacements in tangential and radial directions

UNIT–IV

7. Derive the expression for maximum shear stress in three dimensional case and show the planes of maximum shear stress on principal coordinate system

OR

8. a) What is homogeneous deformation?

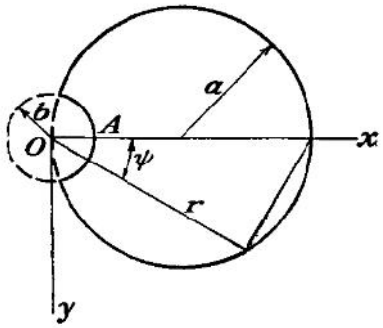
   b) Derive the differential equations of equilibrium for a 2-demensional state of stress and state the same of for three dimensional state of stress

UNIT–V

9. Show that for the same twist, the elliptical section has a greater shearing stress than he inscribed circular section (radius equal to the minor axis 'b' of the ellipse). Find out which of the above takes greater torque for the same allowable stress

OR

10. Evaluate the torsional rigidity of the section shown in the Fig bellow.



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