B.C.E Examination ,2017

(4TH YEAR, 1ST SEMESTER, SUPPLEMENTARY)

ref no EX/CE/T/415/2017(S)

Theory structures –IV

Time 3 hours   Full Marks 100

Use separate answer script for each part

Part –II

Answer Q1 and any one from Q2 & Q3

Assume reasonable values of any data if required

Notations have their usual meaning

Q 1   a) What are the advantages and disadvantages of shell roofs ?

b) Why the edge beams are provided at the edges of the typical cylindrical shell ? State the nature of force acting on the edge beams .

c) A rectangular steel plate 3m X 2m simply supported at the edges carrying a uniformly distributed load of 4KN/m². Find the maximum deflection of the plate. Derivation is needed assuming plate equation $\nabla^4 w = q/D$. Take $v =0.25$. Thickness of the plate is 30 mm . What will be the changes in the maximum deflection of the plate if the loading on the plate is sinusoidal having maximum value at the centre is 4 KN/m² and zero at the edges.   **2+3+25**

Q2   Determine the stress distribution of N_ϕ at the center span and Nx at the edge of a simply supported symmetrical cylindrical shell of radius 12m , span 30 m and central angle 120⁰ under dead load of thickness 100mm and live load of 0.75 KN/m² (detail derivation is required).

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Q3   A spherical dome over a circular room is to be constructed. Diameter of the room is 30m.The radius of the spherical dome is 16m.Thickness of the dome is 100 mm. Live load = 0.75 KN/m². The dome is subjected to a concentrated load of200 KN at the crown, Find the meridional stress and hoop stress at an interval of 10⁰ from vertical axis. Deduce the expression for the above stresses. Sketch also the typical reinforcement generally provided in reinforced concrete dome.

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Name of the Examination: B. Civil Engg. 4th Year 1st Sem. Supplementary Exam 2017

Subject: Theory of Structure – IV   Time: Three (3) hours   Full Marks: 100

Part II

Use Separate Answer Scripts for Each Part

(Answer Any Two (2))

Question 1 – Develop the two-dimensional equilibrium equation of an elastic problem in Polar Coordinates. Hence obtain the compatibility equation in the absence of body forces. Also comment on the nature of solution when the stress distribution is symmetrical about an axis.

(10+10+5)

Question 2 – The equilibrium of a physical system is described by the following differential equation

$$-\frac{d^2u}{dx^2} - u + x^2 = 0 \ for \ 0 < x < 1$$

with u(0) = 0 and u(1) = 1.

Obtain the solution to the differential equation using Ritz's weak variational formulation. Compare the results with the results obtained using Collocation Method. Tabulate the results at four (4) intermediate points. (25)

Question 3 (a) Obtain the Lagrangian interpolation functions for a four-node finite element. Also state the properties of the interpolation functions. (5 + 3)

(b) Develop the constitutive equation for a plane strain problem. (5)

(c) What are Lame's parameters? From the generalized Hooke's Law develop the relationship between Young's Modulus, Shear modulus and Poisson's ratio with the Lame's parameters. (2 + 10)