

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute, affiliated to SUK)
Unit Test-02

First Year M. Tech. Civil-Structural Engineering, SEM. - II
Course: **Finite Element Analysis**, Course Code: **CES 1114**

Enroll No

Q.P.Code

UT4165

Day & Date: Thursday, 14-07- 2022

Time: 11.45am to 12.45 pm

Max Marks- 25

Instructions: 1) *Attempt all questions.*

2) *Figures to the right indicates full marks*

3) *Assume suitable data, if required*

4) *Use of nonprogrammable calculator is allowed*

- Q.1a) State plane strain and plane stress problems with civil engineering applications. CO₁ 4
- b) Explain detail procedure to develop element stiffness matrix [K] for LST element starting from displacement model. CO₂ 6
- OR**
- b) Formulate element stiffness matrix for triangular ring axisymmetric element. CO₂ 6
- Q.2a) Write note on the confirming and non-confirming element for F.E. displacement model. CO₁ 6
- b) Define HBW and Explain the importance of node numbering in FEM. CO₁ 4
- c) Define shape function and state its importance in FEM. Also derive shape function for 4 noded rectangular element using Lagrange functions. CO₂ 5



UT II, 2022
F. Y. M. Tech Structural Engineering, Semester II
Course: Advanced Solid Mechanics, Course Code: CES 1124

Date & Day: 15-07-2022, Friday
Time: 11:45am to 12:45pm

Maximum Marks: 25

- Instructions:**
1. All questions are compulsory.
 2. Figures to the right indicate full marks.
 3. Use of non-programmable calculator is allowed.
 4. Assume suitable data if necessary and mention it clearly.

- 1 a** If the strain components at a point are:
 $\epsilon_x = 0.0004$, $\epsilon_y = 0.0002$, $\epsilon_z = -0.0003$, $\gamma_{xy} = -0.0001$, $\gamma_{yz} = 0.0002$, $\gamma_{zx} = -0.0002$.
Determine the stress components at that point, assuming $E = 2 \times 10^5 \text{ MPa}$ and $\nu = 0.3$. **04**
- b** A cantilever beam loaded at its free end has Airy's stress function, $\Phi = Bxy + \frac{D}{6} x y^3$. Taking boundary conditions $\tau_{xy} = 0$ at $y = \pm C$ and $\int_{-C}^{+C} \tau_{xy} dy = -P$, where $2C$ represents depth of the beam. Assume width of beam as unity. Investigate the stresses in comparison with stresses as per elementary Strength of Materials. Refer **Figure 1(b)**. **08**
- 2 a** A thin walled square box section is designed to resist torque as shown in **Figure 2(a/i)**. If the maximum shear stress developed in the section is 80 N/mm^2 , estimate the torque resisted by the section and angle of twist if the length of the member is 3 m . If the member is redesigned as a thin walled circular tube as shown in **Figure 2(a/ii)**, find the allowable twisting moment and the angle of twist. Assume $G = 0.84 \times 10^5 \text{ N/mm}^2$. **08**

OR

- a** A steel box girder has the cross section as shown in **Figure 2(a)**. The wall thickness is uniform of 10 mm . If the shear stress due to torque is limited to 100 N/mm^2 , determine
(i) The maximum permissible torque,
(ii) The twist per meter length under the torque. **08**
- b** Derive the expressions for shearing stresses for rectangular cross section of width '2a' and depth '2b' subjected to torque 'T'. Show the distribution of shearing stresses on cross section. **05**



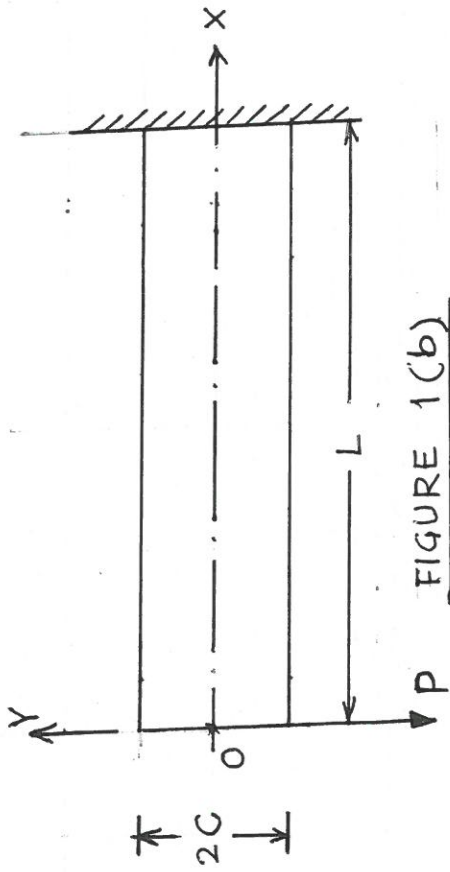
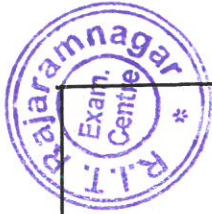
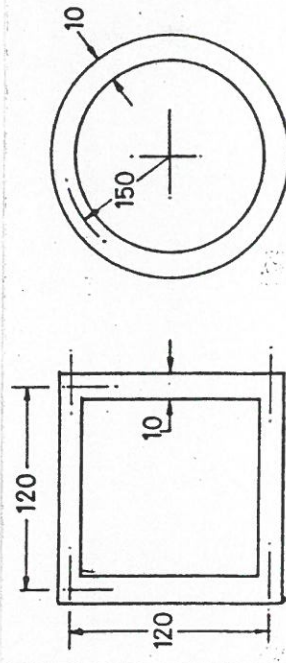


FIGURE 1(b)



ALL DIMENSIONS ARE IN MM.

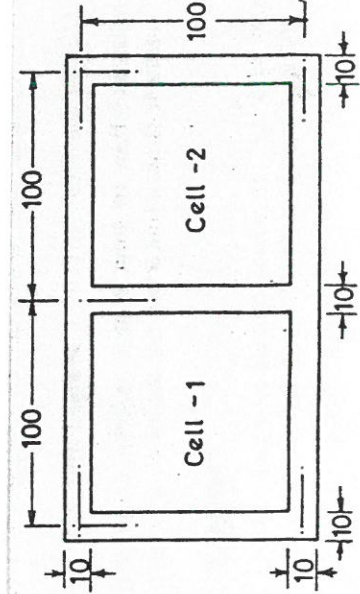


FIGURE 2(a/i)

FIGURE 2(a/ii)

FIGURE 2(a)

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Unit Test 2 July 2022

First Year M. Tech. (Civil-Structural Engineering) Semester II

Course: Advanced Earthquake Engineering (PE-III)

Course Code: CES1134

Day & Date: Friday, 15/07/2022

Time: 3.45 to 4.45 pm.

Max Marks: 25

Instructions:

1. All questions are compulsory.
2. Use of non-programmable calculator is allowed.
3. Assume suitable data if necessary.

Q.1

- a. Discuss behavior of beams, columns, joints in RCC buildings during earthquake & remedial measures. **CO2 05**
- b. Explain importance of base isolation concept during earthquake **CO3 05**

OR

- b. Explain cyclic loading behavior of RCC & prestressed concrete elements **CO3 05**
- c. Illustrate earthquake resistant measures in RC buildings. **CO3 05**

Q.2

- a. A RC circular water tank container 60 m³ capacity has internal diameter of 6.25 m and height of 4.2m (including free board of 0.5 m) supported on RC staging consist of 4 columns 500 mm diameter with horizontal bracing 350 x 500 mm at four levels. The lowest supply level is 13m above ground level. Staging conforms to ductile detailing as per IS 13920. Staging columns are isolated with rectangular footing at depth of 3.0 m from ground level. Soil is located on soft soil in seismic zone II. Concrete M25, steel fe 415, density 25 KN/M³. Analyze the tank for seismic loads. **CO4 10**

OR

- a. A RC rectangular water tank container 55 m³ capacity has internal dimensions of 4.5 x 6 m and height of 4.2m (including free board of 0.5 m) supported on RC staging consist of 4 columns 450 mm diameter with horizontal bracing 375 x 475 mm at four levels. The lowest supply level is 12m above ground level. Staging conforms to ductile detailing as per IS 13920. Staging columns are isolated with rectangular footing at depth of 3.2 m from ground level. Soil is located on soft soil in seismic zone II. Concrete M25, steel fe 415, density 25 KN/M³. Analyze the tank for seismic loads. **CO4 10**





K. E. Society's Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute)

F. Y. M. Tech Civil Engineering Sem.- II

Unit Test 2

July- 2022

ap code
UT4219

Code No. & Name of Course : CES1164 DESIGN OF PRESTRESS CONCRTE
STRUCTURES (P. E. 4)

Day & Date : sat., 16/07/2022

Time : 3.45 to 4.45 pm.

Max. Marks : 25

Instructions : All questions are compulsory
Figures to the right indicate full marks
Assume suitable data if necessary and mention it

- Q.1. a) A post tensioned prestressed concrete beam of rectangular section 200mm wide is to be designed for an imposed load 3.3 kN/m over a simply supported span of 10.5m. A stress in concrete must not exceed 12N/mm^2 in compression and 1.4N/mm^2 in tension at any time. Loss of prestress is 15%. Calculate a) Minimum depth required b) Initial prestressing force c) Eccentricity required d) Number of cables required if the prestress in steel is 1400N/mm^2 . CO5 10

OR

A prestressed concrete beam 300mm wide and 800mm deep is subjected to an effective prestressing force of 1400kN along the longitudinal centroidal axis. The cable may be assumed to be symmetrically placed over mild steel anchor plate in an area 200mmX400mm. Design the end block. CO5 10

- Q. 2 The cable profile for two span continuous beam is as shown in following Fig.1, the prestressing force being 1090kN. Find or Locate the pressure line due to the prestressing force alone. CO4 15

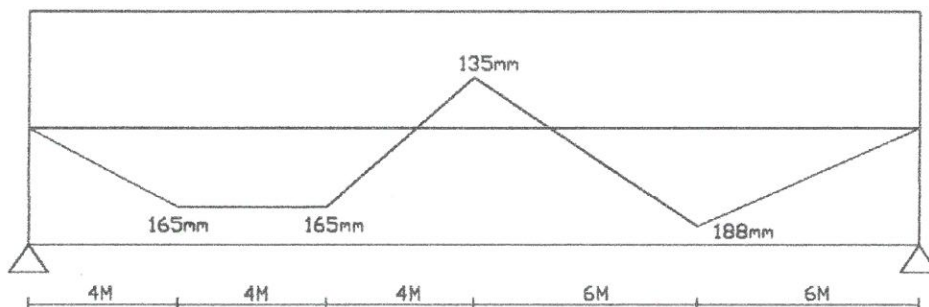


Fig. 1

