JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TERM 3 EXAMINATIONS–2023

M.Tech.–II Semester (Structural Engineering)

COURSE CODE (CREDITS): 12M1WCE213 (3)   MAX. MARKS: 35

COURSE NAME: Earthquake Resistant Design of Structures

COURSE INSTRUCTORS: Sugandha Singh   MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

1. Describe the different types of tectonic plate boundaries.   [5]

2. What is a RotDNN spectrum? For the data given below, find the following values.   [5]

   a. RotD00 for period 0.25s.   [1]

   b. RotD50 for period 1s.   [1]

   c. RotD100 for period 0.05s.   [1]

Period (s)	0^0	10^0	20^0	30^0	40^0	50^0	60^0	70^0	80^0	90^0
0.05	0.3g	0.5g	0.25g	0.6g	0.1g	0.05g	0.15g	0.7g	0.4g	0.65g
0.25	1.5g	0.5g	0.6g	2.7g	3g	4g	2.5g	2.5g	2.6g	3.5g
1.0	1.0g	1.8g	1.9g	1.5g	1.2g	1.4g	1.6g	1.9g	2.0g	1.8g

3. In brief, discuss the problems in the Force–based earthquake resistant design of structures.   [5]

4. What is Section Ductility? How is it calculated? How does the neutral axis depth affect the section ductility capacity?   [5]

5. For the cantilever column section shown below, calculate the following values. *(Assume that $E_c=30000$ MPa, $E_s=200000$ MPa, $f_{ck}=25$ MPa, $f_y=400$ MPa, $f_u=600$ MPa)*

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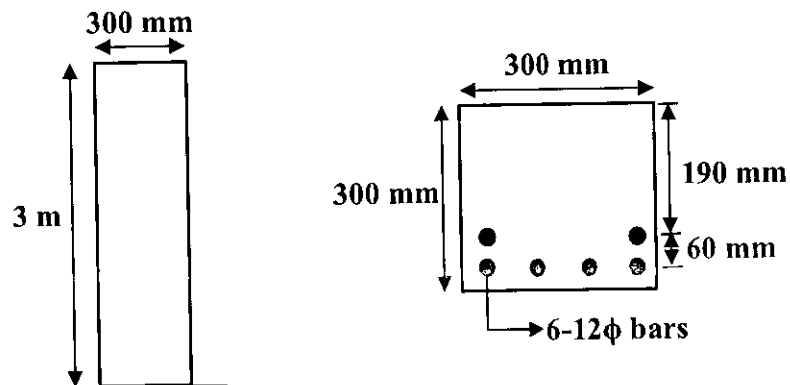
a. First Yield Moment (M_y'), Curvature (ϕ_y'), Force (F_y'), and Displacement (Δ_y') at steel yield strain, $\epsilon_y = 0.002$. [4]

b. Ultimate Moment (M_u), Curvature (ϕ_u) at ultimate concrete strain, $\epsilon_{cu} = 0.004$. [2]

c. Equivalent Yield Curvature (ϕ_y). [1]

d. Ultimate Force (F_u) and Displacement (Δ_u). [3]

6. As per IS 13920, answer the following questions:

a. What is the maximum stirrup spacing in the lap splice region in a beam? [1]

b. With the help of proper illustrations, show how design shear is calculated in a beam subjected to sway to the left. [3]

c. What is a crosstie and how is it used in earthquake resistant design of a structure? [1]