(9)

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2026

M.Tech-II Semester (SE)

COURSE CODE (CREDITS): 25M11CE212 (3) MAX MARKS: 35

COURSE NAME: Earthquake Resistant Design of Structures

COURSE INSTRUCTOR: Mr. Chandra Pal Gautam MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems
(c) Use of calculator is allowed

<table>
<tr><th>Q.No</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q1</td><td>(i) According to IS 13920:2016, what is the primary objective of ductile detailing in reinforced concrete structures located in seismic zones?
(ii) As per IS 13920, what are the basic recommendation for beam size and beam reinforcement.
(iii) As per IS 13920, what are the basic recommendation for column size and column reinforcement.
(iv) Discuss use of shear wall and its types.</td><td>4</td><td>8</td></tr>
<tr><td>Q2</td><td>For the given moment in beam, design the beam as per IS 456 and IS 13920:2016. Design the beam for flexural reinforcement only. Assume the beam is of 5m length, dimensions = 450mm X 650mm and axial force in beam is 10kN. Use M30 and Fe415 for the design.
<table>
<tr><td></td><td>Left (kNm)</td><td>Middle (kNm)</td><td>Right (kNm)</td></tr>
<tr><td>DL + LL</td><td>-47.35</td><td>21.85</td><td>-52.43</td></tr>
<tr><td>EQ_X</td><td>-80</td><td>10</td><td>75</td></tr>
</table></td><td>4</td><td>8</td></tr>
<tr><td>Q3</td><td>For the beam in problem 2, find the shear force due to plastic hinge formation at ends of beam as per clause 6.3.3 (b).</td><td>4</td><td>5</td></tr>
<tr><td>Q4</td><td>For the given moments and axial force in column, design the column as per IS 456 and IS 13920:2016. Design the main reinforcement of column only. Assume the column is of 3.5m length, dimensions = 500mm X 600mm. Use M30 and Fe415 for the design. Assume the column is short, $M_u/f_{ck}bd^2 = 0.07$ from SP16 and $\alpha_n = 1$.
<table>
<tr><td></td><td>P(kN)</td><td>M_X (kNm)</td><td>M_Y (kNm)</td></tr>
<tr><td>DL + LL</td><td>70</td><td>15.5</td><td>12</td></tr>
<tr><td>EQ_X</td><td>50</td><td>30</td><td>57</td></tr>
</table></td><td>5</td><td>7</td></tr>
<tr><td>Q5</td><td>Check whether the given details of beam and column making a joint in a frame is strong column and week beam connection. Assume $M_u/f_{ck}bd^2 = 0.03$ for the column. Use M35 and Fe415 for the check. Column is of size 300X600mm with percentage of steel 3.8% and beam is of 300X500mm size with percentage of steel 2% at top and 3% at bottom.</td><td>5</td><td>7</td></tr>
</table>