**Answer sheet Module: Nonlinear simulation of structures using OpenSees**

|  |  |
| --- | --- |
|  | **Required result** |
| (a) | K =  Mp =  Vp =  dy =  Vn =  Is the member controlled by shear or flexure? = |
| (b) | Disp. for 0.9Vp =  Kmodel  =  K/ Kmodel =  Considering shear deformation (no PDelta):  Disp. for 0.9Vp =  Kmodel  =  K/ Kmodel =  Considering PDelta effects (no shear deformation):  Disp. for 0.9Vp =  Kmodel  =  K/ Kmodel =  Importance of shear deformation and/or PDelta effects? = |
| (c) | P max =  P min =  Total displacement at the onset of degradation =  Comment about total displacement at the onset of degradation = |
| (d) | Disp. for 0.9Vp =  Kmodel  =  K/ Kmodel =  Why the difference with theoretical value? = |
| (e) | P max =  P min =  Differences with part (c)? = |
| (f) | Disp. for 0.9Vp =  Kmodel  =  K/ Kmodel = |
| (g) | P max =  P min =  Comment about the model results and hand calculations = |
| (h) | 5-element discretization:  P max =  P min =  10-element discretization:  P max =  P min =  15-element discretization:  P max =  P min =  Comment element discretization =  How many elements would you recommend? Why? = |
| (i) | 5-element discretization:  P max =  P min =  10-element discretization:  P max =  P min =  15-element discretization:  P max =  P min =  What is the effect of material degradation on the axial force on the member? Is this realistic? Why? =  How many elements would you recommend? Why? = |
| (j) | 5-element discretization:  P max =  P min =  10-element discretization:  P max =  P min =  15-element discretization:  P max =  P min =  What is the effect of releasing the horizontal degree of freedom? Why? = |