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

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|  | **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? =  |