Problem 1 (10 points) – Problem Definition
Consider the design problem of illuminating books being read by passengers seated in cars of the proposed California High Speed Rail (CHSR) line running between San Francisco and Los Angeles (3 h journey, accommodations on the ‘nice’ side). Prepare a Problem Definition by identifying and refining users, needs, and functional requirements.
Problem 2 (10 points) – Concept Generation
Consider the design problem of hanging a row of about 20 pictures (already-existing wood-framed photos, about 8 in. by 12 in.) in a hallway. The hallway has a tiled ceiling of the same construction as is used in this examination room (try to avoid examining your neighbors’ exam papers as you gather domain knowledge). The hallway walls may be touched lightly, but the surface of the walls must not be marred by the pictures (i.e. no fasteners, stickers, drilling, et cetera). The functional requirements are: pictures must be level (no tilting about a central picture hook); picture row must be of uniform elevation (i.e. the row of level pictures is straight); pictures must be easily visible to hallway traffic. Create a three-function, nine-working principle (total) morphological matrix, and synthesize one overall concept. Explain and justify.
Problem 3 (5 points) – Concept Assessment
Consider the design problem of restricting Ground Vehicle access to the driveway behind Wiggins Hall. Needs are: exclude GV’s with a legitimate but insufficient reason for parking there; allow access by GV’s with a legitimate and sufficient reason for parking there; low installation cost; low operation time; long mean time between failures. The existing device is submersible bollards (bollards retract into holes in the ground), and these ran into trouble when it turned out that they were submerging into pools of water and the submerging mechanism was corroding. Potential replacement concepts are: removable bollards (i.e. lift them up and lay them aside); and a low swinging gate (two-sided). Create a datum-style weighted decision matrix using the submerging bollards as the datum, and evaluate the satisfaction of both concepts. Briefly justify your weights and scores.