Department of Civil Engineering, IIT Delhi

CVL141 – Civil Engineering Materials, Major – Semester I – 2018-19

Please give concise and to-the-point answers to all questions. The limit of number of words is listed. Words beyond the limit will not be considered. No extra sheets.

Question 1 (15 marks, 225 words): Indicate with reasons whether the following statements are true or false (No marks without correct reasons. Give concise 1 line reasons and answer in the correct order.):

a) Mean compressive strength of concrete should be used for design of structures.
b) Sometimes cracks in concrete may not reduce the safety of the structure.
c) Under normal conditions, reinforcing steel does not corrode in reinforced concrete.
d) Concretes with lower water to cement ratio have higher autogenous shrinkage.
e) Saturated light-weight aggregates can cause swelling in concrete.
f) Membranes are more useful for curing of low water to cement ratio concretes.
g) Codes usually limit the maximum allowable clear cover for reinforcement.
h) High slump concretes are more suitable for roller compaction.
i) Quenched steel is harder than annealed steel.
j) TMT (thermo-mechanically treated) steel bars can be welded together.
k) To reduce its viscosity, bitumen is usually diluted in water.
l) The volume fraction of aggregates in concrete should be maximised.
m) Silica fume is highly soluble in pure water.
n) Sonication should be carried out before mixing of carbon-nanotubes. (Not for Aviruddh Banwariya)
o) Water is required for self-healing of concrete. (Not for Riya)
p) Cement can be replaced by bitumen in most applications. (Only for Aviruddh Banwariya and Riya)

Question 2 (15 marks, 150 words): Give 1 possible reason and 1 possible method of prevention for each of the observations below. (Answer in the correct order and do not repeat the reason and method of prevention.)

a) Plastic shrinkage cracks in concrete.
b) Segregation in freshly mixed concrete.
c) Large and strong lumps of cement in cement bags stored on the site.
d) Segregation in aggregates stored at a ready mix concrete plant.
e) Cracks in a bridge pier with gel marks on the cracks.
f) Stiffening of concrete before placing.
g) Low pH in mature concrete.
h) Map cracks appearing 3 years after casting of a slab.
i) Blisters appear in a bitumen coating.
j) Honeycombing observed upon removal of formwork.

Question 2 (10 marks, 80 words): If you were to create a new construction material, list the 10 most important properties that you would expect from this material. Explain the relevance of each property in no more than 5 words each.