UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 6 Examination in Engineering: October 2015

Module Number: CE 6319 **Module Name: Design of Concrete Structures II**

[Two Hours]

[Answer all questions]

Code of Practice BS 8110 Part 1: 1997 and BS 8007: 1987 are provided

Q1. A roof-top water storage tank is to be designed for a multistory housing complex. The water tank is supported on the reinforced concrete frame of the building. The length of the tank is 6.0 m. Internal dimensions of the water tank are as shown in Figure Q1. The top of the wall was allowed to have free movements by providing a Neoprene pad between roof slab and wall top.

The following information is also available.
Grade of concrete to be used for the water tank: C35A
Density of concrete: 24 kN/m^3
Coefficient of thermal expansion of concrete: $10 \times 10^{-6}/^0C$
Fall in temperature between hydration peak and ambient (T_1): 30^0C
Fall in temperature due to seasonal variations (T2): 15^0C
Density of water: 9.81 kN/m^3
Reinforcement steel: Grade 460 (type 2 Deformed bars)

You may assume any missing information but state your assumptions clearly.

a) Determine the effective length, effective width and effective height of the tank walls and show that long wall is spanning as one-way slab.
Discuss merits and demerits on provision of "Neoprene pad" between top slab & wall.

[1.0 Mark]

b) Calculate maximum water pressure acting on the long wall at severability and ultimate limit state.

[2.0 Marks]

c) Calculate required moments and forces acting on the long wall under serviceability and ultimate limit state.

[4.0 Marks]

d) Calculate the amount of reinforcement required for the long-wall to resist ultimate bending moment due to water load.

[4.0 Marks]

g) Without performing calculations, discuss how you will determine maximum crack width of the long wall under serviceability bending moment.

[2.0 Marks]

i) Why it is always an advantage to provide the steel requirement with the smallest feasible bar diameter for crack control.

[2.0 Marks]

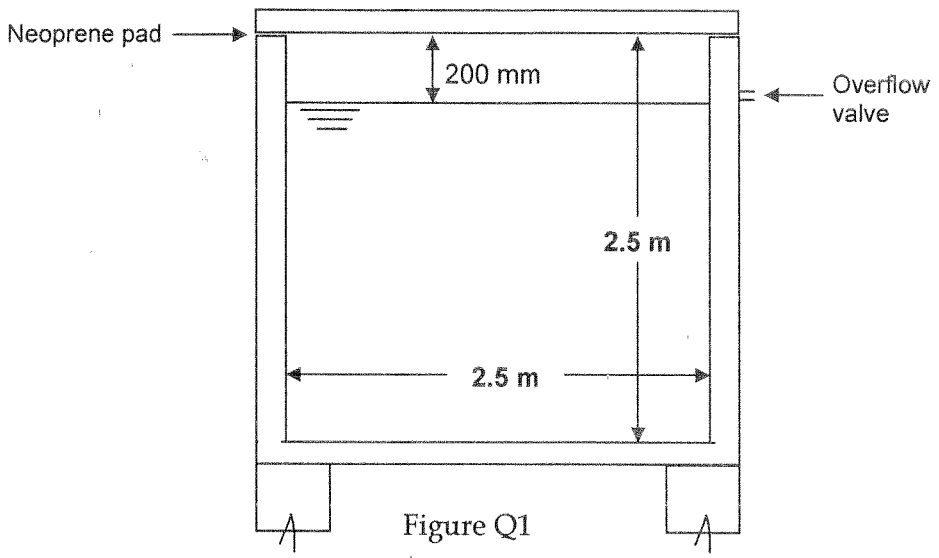

Figure Q1

Q2. a) List various applications of high performance high strength prestressed concrete (PC).

[1.0 Mark]

b) Discuss the merits and demerits of Class 3 design in comparison to Class 1.

[2.0 Marks]

c) Discuss durability performance of prestressed concrete bridges compared to reinforced concrete bridges

[1.0 Mark]