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University Examinations 2013/2014

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

ECV 0228: THEORY OF STRUCTURES III

DATE: APRIL 2014 **TIME: 1 ½ HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE – (30 MARKS)

(a) A simple beam AB of span length 7m must support a uniform load $q = 60kN/m$ distributed as shown in figure Q 1(a).

(i) Draw shear force and bending moment diagrams

(ii) Determine the required section modulus S if the allowable bending stress $\sigma_{allow} = 110MPa$ (15 Marks)

(b) A 50mm by 75mm, 1.5m long bar of negligible weight is loaded as shown in figure Q 1(b). Determine the maximum tensile and compressive stresses acting normal to the section through the beam. (15 Marks)

QUESTION TWO – (15 MARKS)

A channel beam having the cross-sectional shape shown in the figure Q2 is simply supported at the ends (span length L = 3m) and carries a concentrated load $P = 90kN$ at the midpoint. Determine the maximum tensile stress σ_t and maximum compressive stress σ_c due to the load P, assuming b = 450mm, h = 180mm, and t = 30mm. (15 Marks)

QUESTION THREE – (15 MARKS)

The end regions of bar AB (see figure Q3) have square cross-sections with sides of length b. In the middle of the bar the cross-sectional area is reduced by one half by cutting a notch of depth $b/2$. An axiel load P acts at the centroid of the cross-section at end B. Determine the maximum tensile σ_t and compressive σ_c stresses at section mn within the reduced region of the bar.

(15 Marks)

QUESTION FOUR – (15 MARKS)

A composite beam having the cross-sectional dimensions shown in figure Q4 is subjected to a positive bending moment M = 4kN.m. Calculate the maximum and minimum stresses in both materials of the beam assuming $E_1 = 7GPa$ and $E_2 = 140GPa$ (15 Marks)