NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING
BACHELOR ARCHITECTURAL STUDIES
PART I FIRST SEMESTER EXAMINATIONS – DECEMBER 2005

STRUCTURAL DESIGN I – AAR 2105

TIME: 3 Hours **TOTAL MARKS:** 100

INSTRUCTIONS:

Answer **4** questions.

QUESTION 1

a) Write brief notes on the design process for structures (10 marks)

b) Why is it necessary to determine bending moments and shear stress diagrams in structural design. (5 marks)

c) Draw a bending moment and shear force diagrams of the beam below (fig. 1)

QUESTION 2

(a) Show that the moment of Inertia (second moment of area) of a rectangular shaped beam is ½ bd^3 (12 ½ marks)

(b) Calculate the Ixx of the compound girder shown in fig. 2 below disputes? (5 marks)

QUESTION 3

a) A timber joist 75mm wide has to carry a uniform load of 10KN on span of 4m. The bending stress is to be 6 Nmm^2. What depth should the joist be? (12 ½ marks)

b) A 250 mm x 75mm timber with its longer edge vertical spans 2m between supports. What safe uniformly distributed load W can the beam carry if the permissible bending stress is 8N/mm^2. (12 ½ marks)

QUESTION 4

a) A steel beam is required to span 5,5m between centers of simple support carrying a 220mm thick brick wall as detailed on fig. 3. below. Choose from the table of properties attached a suitable beam section given that the permissible stress in bending is 165 mm^2. Choose from the table of properties attached a suitable beam section given that the permissible stress in bending is 165 mm^2.

b) A timber beam150mm x 300mm deep has two steel plates, each 125mm x 12mm bolted as shown on fig. 4 below. Assume the safe steel stress is 140N/mm^2, E for steel is 205000N/mm^2 and E for timber is 8200 N/mm^2, calculate the moment of resistance of beam (ignore bolt holes)

(10 marks)

QUESTION 5

a) A 457 x 191 UB98 is simply supported at the ends of a span of 7,2m. The beam carries an inclusive udl of 350kN. Calculate the maximum deflection. E for steel is 205 0000 N/mm^2. (12 ½ marks)

b) Calculate the safe inclusive uniformly distributed load for a 200 mm x 75mm timber joist, simply supported at its ends, if the span is 6m. the maximum bending stress is 6 N/mm^2 and the maximum permissible deflection is 0,003 of the span.

E = 95 99 N/mm^2 (12 ½ marks)

END OF EXAMINATION