

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY
DEPARTMENT CIVIL AND WATER ENGINEERING
BACHELOR OF ENGINEERING (HONOURS) DEGREE
PART II EXAMINATION - JUNE 2006
STRUCTURAL ANALYSIS I – TCW 2203

TIME: 3 HOURS

MAXIMUM MARK: 100

INSTRUCTIONS:

ANSWER ALL QUESTIONS.

QUESTION 1

- a) Inspect the kinematic stability of the structures shown in Fig. 1. (10 Marks)
b) State whether each structure is determinate or not. (5 Marks)

QUESTION 2

Fig. 2 shows a structure of uniform cross sectional area and built of the same material. Construct the influence line diagram for the

- i) Support reactions. (4 Marks)
ii) Shear force at point I (4 Marks)
iii) Bending moment at point I (4 Marks)

Also find the maximum bending moment in the section due to a train of three vertical point loads travel along the structure. The trainload is as follows, a load of 80kN followed by a 60kN load whose point of application is 2m from the 80kN load, which is in turn followed, by a 100kN load located at 3m from the 60kN load. (15 Marks)

QUESTION 3

Find the member force in truss shown in fig. 3. (10 Marks)

QUESTION 4

- iv) For the frame shown in Fig 3 which consists of members of constant flexural rigidity determine the vertical deflection at C if the frame is subjected to the same loading regime as that shown in the question number three. **Use the virtual work method (unit load Method)** (20 Marks)
a) Use Fig. 4 to prove Maxwell's reciprocal theorem. (5 Marks)

QUESTION 5

- a) The rigid frame shown in fig. 5 has uniform flexural rigidity EI . Using Castigliano's theorem, find the vertical and horizontal displacements at C.

(18 Marks)

- b) Sketch the deflected shape of the frame. What rotation do you expect at B? Justify your answer. (5 Marks)