TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

EBC 2208 : STRENGTH OF MATERIALS II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 22 Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question One (Compulsory)

a) State the assumptions made in the theory of simple bending **(5 marks)**
b) Discuss the major modes of retaining walls failure **(6 marks)**
c) State the major assumptions made in Rankine earth's pressure theory. (**5 marks)**
d) A simply supported timber beam of rectangular section is to support a load of 30kN uniformly distributed over a span of 3.5 metres. If the depth of the section is to be twice the breadth and the stress in timber is not to exceed $7N/mm^2$ .find the dimensions of the beam cross-section. **(6 marks)**
e) A beam of length 1.3M and cross sectional dimensions 150mm wide by 250mm deep is simply supported and carries a point load W at mid-span. The permissible stresses are $7N/mm^2$ in bending and $1N/mm^2$ in shearing. Calculate the safe load that the beam can carry. **(8 marks)**

Question Two

a) Derive the equation for horizontal shear stress in rectangular beams and show that the maximum shear stress in rectangular beams equals 1.5 the average shear stress **(8 marks)**
b) The shear force acting on a section of a beam with a T cross-section dimensions 100mmx100mm x 20mm is 50kN.
   i. Calculate the maximum horizontal shear stress induced in the beam.
   ii. Calculate the shear stress at the junction of the web and flange **(12 marks)**

Question Three

a) An iron pipe of external diameter 50mm and internal diameter 30mm is 5 metres long, simply supported and carries a point load of 60kN at midspan. If the self-weight of the pipe is 2kN/m determine the maximum stress induced in the iron pipe. **(8 marks)**
b) A beam of length 6 metres and a cross-section as shown in Figure Q3 below is subjected to a uniformly distributed load of 5 KN/m (including its self-weight). Determine the maximum tensile and compressive strength. **(12marks)**

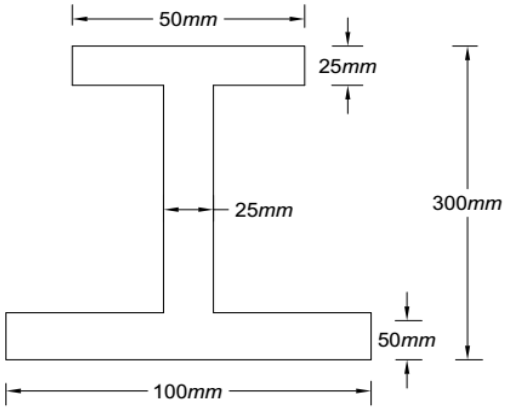

Figure Q3

Question Four

Figure Q4 shows a retaining wall of density 2500 Kg/M^3 which supports a cohesionless soil of density 1900 Kg/M^3 and angle of shearing resistance of 28^0.

Examine the stability conditions of the wall with regards to

i. Tension in joints
ii. Ground bearing pressure
iii. Factor of safety against overturning **(20marks)**

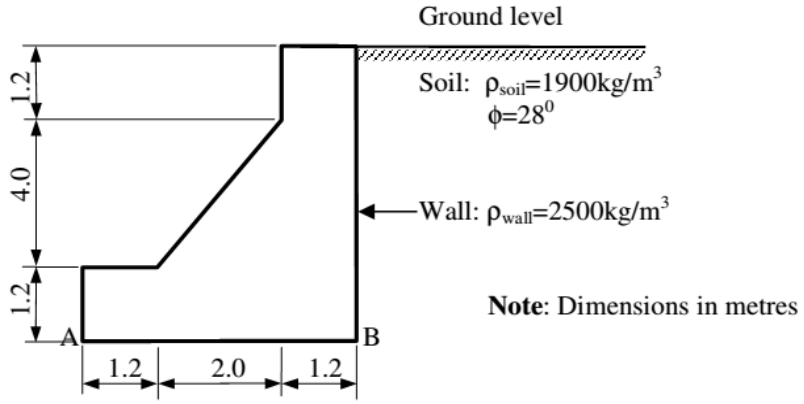

Figure Q4

Question Five

a) A composite beam consists of a rectangular timber core 150x100mm secured along its entire length between two steel plates150x10mm, as shown in Fig. determine the maximum bending stress induced in steel and timber if a bending moment of 7kNm is applied about the neutral axis of the beam. Take E_t=10kN/mm^2 and E_s=210kN/mm^2 **(8 marks)**

b) Figure Q5 below shows a flitched beam consisting of a wooden core 100mm wide by 200mm deep secured along its entire length between two steel plates 10mm thick by 200mm deep. If the maximum stress in the wooden core is 7N/mm^2. Given E_t=1x10^4 N/mm^2 E_s=2x10^5 kN/mm^2. Find

i. The maximum stress in steel
ii. The total moment of resistance of the composite section **(12marks)**

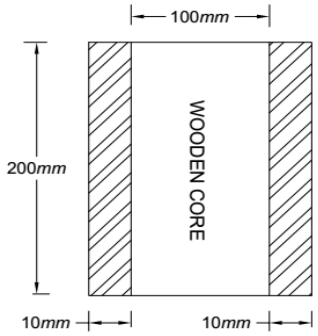

Figure Q5