



TECHNICAL UNIVERSITY OF MOMBASA

---

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

EBC 2208: STRENGTH OF MATERIALS II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

### INSTRUCTIONS TO CANDIDATES

You should have the following for this examination

- Answer booklet
- Scientific calculator

This paper consists of **FIVE** questions

Answer any other **THREE** questions

Use neat, large and well labelled diagrams where required

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed papers.

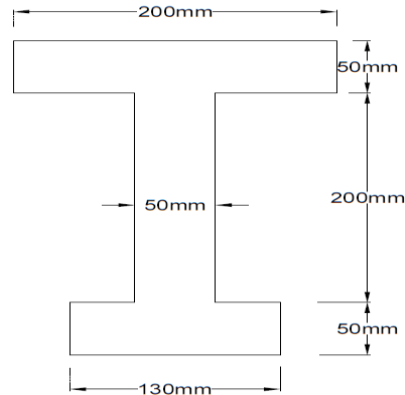


SGS ISO 9001:2008 Certified

## ECE 2208: STRENGTH OF MATERIALS II

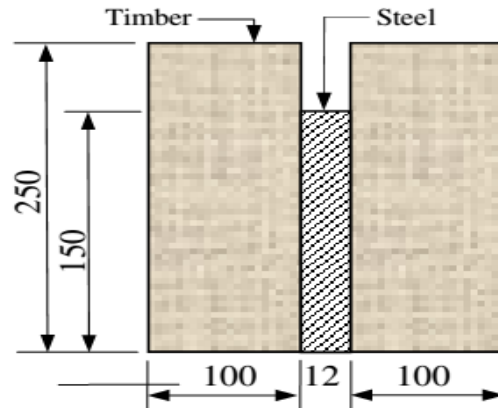
### QUESTION ONE

- a) State the assumptions made in the theory of simple bending. **(5 marks)**
- b) An I-section with unequal flanges of thickness 50mm as shown below is used as a simply supported beam over a span of 7 meters. The beam carries a uniformly distributed load of 5KN/M and a point load of 20KN at mid span. Determine the maximum tensile and compressive stresses. **(15marks)**



### QUESTION TWO

- a) A composite beam consists of a timber and two steel plates rigidly fixed to the top and bottom. Derive the formula for the total moment of resistance. **(6 marks)**
- b) A composite beam consisting of a 12mm thick steel plate sandwiched between two timber joints. The composite beam is subjected to a bending moment of 6.25KNM. Determine the maximum tensile and compressive stresses developed in steel and timber. Take  $E_T=10\text{KN/MM}^2$  AND  $E_S=210\text{KN/MM}^2$  **(14 marks)**



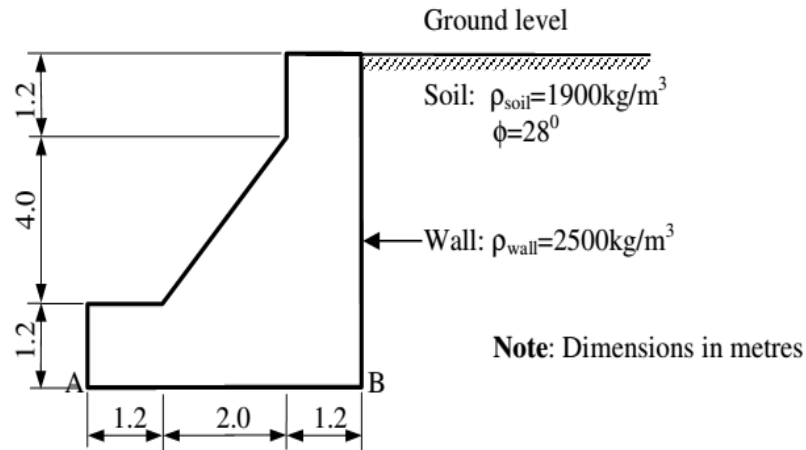
### QUESTION THREE

The figure below shows a retaining wall of density  $2500 \text{ Kg/M}^3$  which supports a cohesionless soil of density  $1900 \text{ Kg/M}^3$  and angle of shearing resistance of  $28^\circ$ .

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)



### QUESTION FOUR

a) Define the term shear stress distribution. (2 marks)

b) Sketch the shear stress distribution of the following shapes

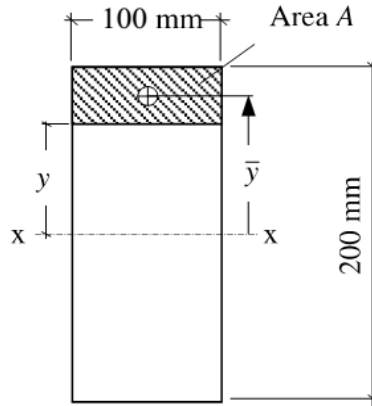
i. I section

ii. rectangular section (4 marks)

c) A rectangular beam 100mm wide by 200mm deep is subjected to a vertical shear force of 5000N. Determine the shear stress distribution at points  $y=75\text{mm}$ ,  $y=50$ ,  $y=25$  and  $y=0$ .

Thus plot the shear distribution curve. (14 marks)





### QUESTION FIVE

- State the major assumptions made in Rankine earth's pressure theory. **(5 marks)**
- Show that the maximum shear stress in a rectangular section equals to 1.5 times the average shear stress. **(5 marks)**
- 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  $7\text{N/mm}^2$  in bending and  $1\text{N/mm}^2$  in shearing. Calculate the safe load that the beam can carry. **(10 marks)**

