THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

ASSOCIATE OF SCIENCE EXAMINATION

SEMESTER I – 2017 DECEMBER

PROGRAMME:	**ARCHITECTURAL AND CONSTRUCTION TECHNOLOGY**
COURSE NAME:	**BUILDING SCIENCE**
CODE :	**BLDG1201**
YEAR GROUP:	**ONE**
DATE:	**WEDNESDAY, 2017 DECEMBER 13**
TIME:	**9:00 A.M. – 11:00 A.M.**
DURATION:	**2 HOURS**
EXAMINATION TYPE:	**FINAL**

This Examination paper has **10** *pages*

INSTRUCTIONS:

1. **THIS EXAMINATION PAPER CONSISTS OF TWO (2) SECTIONS: (A) AND (B)**
2. **ANSWER ALL QUESTIONS FROM SECTION A**
3. **SECTION B CONSISTS OF FOUR (4) QUESTIONS. CHOOSE ANY TWO (2)**

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SECTION B

Instructions: Answer any <u>TWO (2)</u> questions from this section.

Question 1

A. Define the following terms:

i. Yield Stress

ii. Modulus of Elasticity

iii. Malleability

iv. Ductility ***(8 marks)***

B. A steel rod 2.5m long and 12mm diameter carries a tensile load of 10.0kN. The bar increases in length by 1.5 mm when the load is applied. Determine the:

i. Stress ***(5 marks)***

ii. Strain ***(3 marks)***

iii. Young's Modulus of elasticity ***(3 marks)***

C. A tie bar has two holes a distance of 4m apart. By how much does this distance increase when a tensile load of 20 kN is applied to the tie bar? The bar is a rectangular section 40mm x 10mm and the material of which the bar is made has a tensile modulus of 210GPa. ***(6 marks)***

D. A piece of copper wire was used to suspend a neon sign in front of a store. The diameter of the copper wire was 1.22 mm. The sign had a mass of 15 kg. Determine the tensile strength (stress) of the wire. ***(5 marks)***

(Total 30 marks)

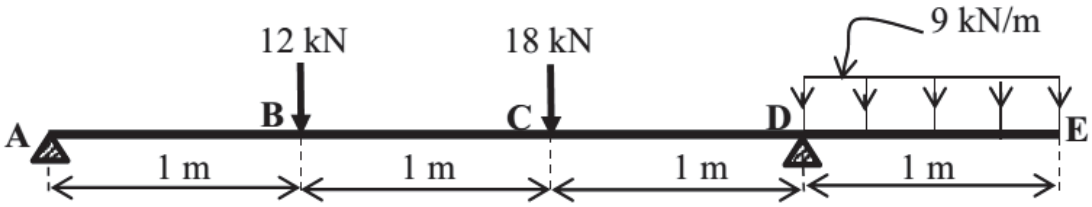
Question 2

A. State the meaning of the following terms as applied to a loaded horizontal beam:

i. shear force *(2 marks)*

ii. bending moment *(2 marks)*

B. The diagram below shows a simply supported beam ABCE.



i. Show that the reactions at A and D are 12.5 kN and 26.5 kN respectively. *(6 marks)*

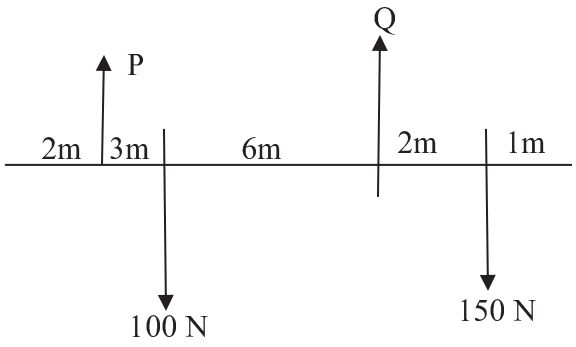
ii. Sketch the shear force diagram and show the shear force at the break points. *(6 marks)*

C. Sketch the bending moment diagram and show values of the bending moment:

iii. at the critical point *(7 marks)*

iv. State the maximum value of the bending moment. *(2 marks)*

D. The diagram shows a uniform plank of weight 200N that has four other forces acting it if the plank is in equilibrium.



Calculate the value of the two unknown forces. *(5 marks)*

(Total 30 marks)

Question 3

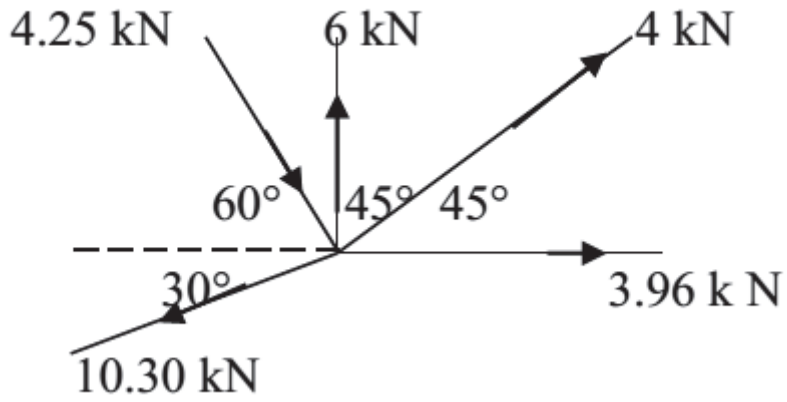
A. Explain the difference between a vector and a scalar quantity and provide **THREE (3)** examples of each. ***(6 marks)***

B. Two tug boats are towing a large boat, of mass 13750 kg, back to shore. Tug boat 1 is pulling with a force of T1 = 7500 N at an angle of 30◦ north of the forward motion and tug boat 2 is pulling with a force of T2 = 8500 N at an angle θ south of the forward motion. If there is a resistive motion of 1050 N opposing the eastern motion, what is the resultant force acting on the large boat? ***(7 marks)***

C. For the system of forces calculate the resultant vector

i. by Resolving the vectors ***(12 marks)***

ii. by the law of Polygon of Forces ***(5 marks)***



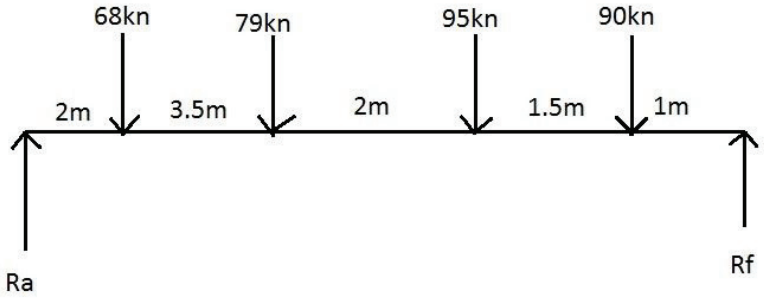
(Total 30 marks)

Question 4

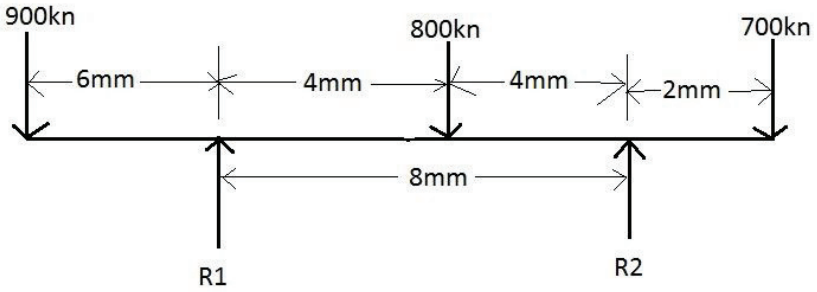
A. Define the 'moment' of a force and state the principle of moments. ***(4 marks)***

B. Define the terms 'resultant force' and 'static equilibrium'. ***(4 marks)***

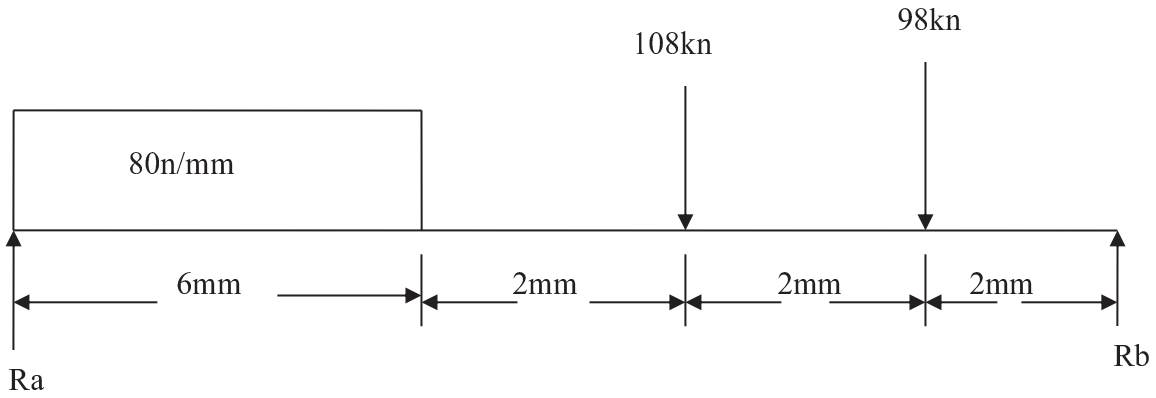
C. Calculate the reactions Ra and Rf due to the give point loads. ***(6 marks)***



D. Calculate the reactions R1 and R2 due to the give point loads. ***(6 marks)***



E. Calculate the reactions Ra and Rb due to the given point loads. ***(10 marks)***



(Total 30 marks)

END OF EXAMINATION