COMMON ASSESSMENT TASK NOTIFICATION

Faculty: TAS	**Year / Class: 12**
Course: Engineering Studies	**Weighting: 25% (325 marks)**
Task Title: Civil Structure	**Class Teacher/s: Mr. DONG**

Due Date: 30/11/2017

TASK INSTRUCTIONS & REQUIREMENTS:

Complete an Engineering Report and six tasks by 30/11/2017

OUTCOMES ASSESSMENT:

H1.1 - SCOPE OF THE PROFESSION: describes the scope of engineering and critically analyses current innovations

H1.2 - MATERIALS SCIENCE: differentiates between properties of materials and justifies the selection of materials, components and processes in engineering

H2.1 - MATERIALS ENGINEERING: determines suitable properties, uses and applications of materials in engineering

H2.2 - IMPACT OF ENGINEERING: analyses and synthesises engineering applications in specific fields and reports on the importance of these to society

H3.1 - MECHANICS: demonstrates proficiency in the use of mathematical, scientific and graphical methods to analyse and solve problems of engineering practice

H3.2 - ENGINEERS REPORT: uses appropriate written, oral and presentation skills in the preparation of detailed engineering reports

H3.3 - GRAPHICAL COMMUNICATION SKILLS: develops and uses specialised techniques in the application of graphics as a communication tool

H4.1 - TECHNOLOGICAL INOVATIONS: investigates the extent of technological change in engineering

H4.2 - TECHNOLOGICAL HISTORY: applies knowledge of history and technological change to engineering-based problems

H4.3 - IMPACT OF TECHNOLOGY CHANGE: appreciates social, environmental and cultural implications of technological change in engineering and applies them to the

analysis of specific problems

H5.1 - TEAM WORK: works individually and in teams to solve specific engineering problems and in the preparation of engineering reports

H5.2 - TIME MANAGEMENT: selects and uses appropriate management and planning skills related to engineering

H6.1 - PROBLEM SOLVING SKILLS: demonstrates skills in research and problem-solving related to engineering

H6.2 - ENGINEERING METHODOLOGY: demonstrates skills in analysis, synthesis and experimentation related to engineering

Marking Criteria		
A **Outstanding**	Extensive applied knowledge & understanding of content - Achieved a very high level of competence	100 - 86
B **High**	Thorough knowledge & understanding of content - Achieved a high level of competence	85 - 76
C **Sound**	Sound knowledge & understanding of content - Achieved adequate level of competence	75 - 56
D **Basic**	Basic knowledge & understanding of content - Achieved a limited level of competence	55 - 41
E **Limited**	Elementary knowledge & understanding of some content - Achieved very limited level of competence	40 - 0

COMMON ASSESSMENT TASK FEEDBACK

Faculty: TAS	**Year / Class: 12**
Course: Engineering Studies	**Weighting: 25% (325 marks)**
Task Title: Civil Structure	**Class Teacher/s: Mr. DONG**
Due Date: 30/11/2017	

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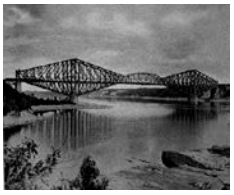
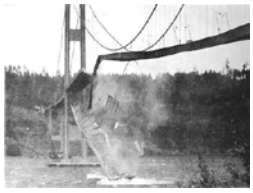
Teacher Feedback:

Engineering Studies

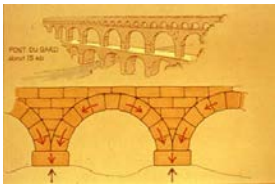
(HSC Course)



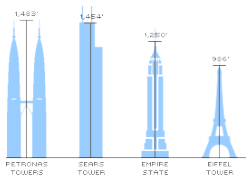










CIVIL STRUCTURES

The Engineering Report 1

&

Class Tasks No 1 - 5

INSTRUCTIONS:

1. All work is to be submitted on A4 paper stapled together at the top LHS of the page and placed in a plastic sleeve. *(Work will not be accepted in plastic display folders)*
2. Headers and footers:
    a. Place the subject name at the top LHS of each page
    b. Place the module name at the top RHS of each page
    c. Place your name at the bottom LHS of each page
    d. Place the page numbers at the bottom RHS of each page
3. Steps:
    a. Write the question first – in red preferably (include any question drawing i.e. scan or paste them onto your page)
    b. Then present your analysis of the problem, include Free Body Diagrams.
    c. Next is the working-out with the answer made bold or underlined. *(No marks will be awarded if there is no working-out shown!)*
4. **Start a new page with every assignment. Correct question numbering is important.**

Ingleburn High School
Faculty of Technology and Applied Studies

Engineering Studies - ASSESSMENT TASK
STAGE 6
Cover Sheet

Task No: 1 Date due: 30/11/2017

Topic: CIVIL STRUCTURES

Marks: _____ / 325

HSC course weighting: (Stage 6 Only)

Engineering Reports: *25% ÷ 5 Reports*

Class Assignments: *25% ÷ ? Assignments*

Task: *(Full details on page 3)*

- Submit all Class Assignments completes for this module.
- Submit the Engineering Report for this module.

Method of Assessment:
Homework research task and class work

TEACHER EXPECTATIONS
We expect you to do your best work at all times. Use clear written communication including correct spelling and appropriate language structure. Students who do not meet the following basic outcomes will be required to redo this work as a learning experience and your original marks given will stand.

Assessment Criteria:
You will be assessed on your ability to:

H1.1 - SCOPE OF THE PROFESSION: describes the scope of engineering and critically analyses current innovations
H1.2 - MATERIALS SCIENCE: differentiates between properties of materials and justifies the selection of materials, components and processes in engineering
H2.1 - MATERIALS ENGINEERING: determines suitable properties, uses and applications of materials in engineering
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H6.2 - ENGINEERING METHODOLOGY: demonstrates skills in analysis, synthesis and experimentation related to engineering

Marking Criteria for Assessment Task:

	No	*Mk*	*Total*
A. The Engineering Report Content			
1. **Title Page** – clear and eye catching			
2. Answers to all questions asked	15	4	*(60)*
Report Presentation			
1. Use of formal language (No I, we etc) as well as grammar and spelling			2
2. Correct numbered headings (1 heading 1, 1.1 heading 2, 1.1.1 heading 3)			2
3. Diagrams, Charts and Tables – Labelled and captioned correctly (Clear no fuzzy images)			2
4. General formatting including – New pages for new sections, appropriate use of spacing, location of graphics			4 *(10)*
Total for Report			**70**

B. Class Tasks

Task 1 - Historical and Technological Changes in Bridge Design	25
Task 2 - Scope of the Engineering Profession	15
Task 3 – Engineering Mechanics and Truss Design	69
Task 4 – Materials Science	40
Task 5 – Graphical Communication - Development of Transition Pieces	20
Task 6 - Team Work: Spaghetti Bridge Design	80
Total for Assignments	**249**

TOTAL FOR MODULE	**319**

Marking guidelines (Indicators)

Code	School Report Levels	Grade	% Mark	Mark	2005 BOS Grade - General Performance Descriptors:
1	Highly Developed	**A**	100 - 86	10 - 9	Extensive applied knowledge & understanding of content - Achieved a very high level of competence
2	Competent	**B**	85 - 76	8 - 7	Thorough knowledge & understanding of content - Achieved a high level of competence
3	Developing	**C**	75 - 56	6 - 5	Sound knowledge & understanding of content - Achieved adequate level of competence
4	Experiencing Difficulty	**D**	55 - 41	4	Basic knowledge & understanding of content - Achieved a limited level of competence
		E	40 - 0	3 - 0	Elementary knowledge & understanding of some content - Achieved very limited level of competence

Feedback to students:

The teacher will provide written or verbal feedback. Comments will inform students about such things as:

- Verbal one to one review
- Class review teacher/class
- Reference to past work samples

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Ingleburn High School - Faculty of Technology and Applied Studies

Engineering Studies – Assessment Task
SUBMISSION RECEIPT

Task No: 1 Date due: 30/11/2017

Topic: CIVIL STRUCTURES

Student name: _____ _____ Date submitted: ____/____/____

Class: _____ Teachers signature: _____

CIVIL STRUCTURES

The Engineering Report Date due: ___/___/___

Investigation and Analysis Report of one Bridge in NSW **Marks 60**

You are to choose one bridge in the state of NSW and supply the following information

1. What is the name of the bridge?
2. Where is it?
3. Insert a picture; sketches and/or drawings of the bridge to outline its construction.
4. What type of bridge is it? (E.g.: Suspension)
5. When did construction begin and finish?
6. Why was it made?
7. Who opened it?
8. How was the bridge construction paid for?
9. Sizes, weights, and other vital statistics.
10. What materials is it made of?
11. Why were those materials used?
12. Where did those materials come from?
13. What types of expansion joints are used on the bridge?
14. How was the bridge constructed? (On site, formwork, pre-stressed, post-stressed, rivets, bolts, etc.)
15. Is this bridge designer used the latest engineering materials and construction techniques? Discuss.

The report must be between 2 - 5 pages in length.

The Report must contain the following:

- **A title page**
- **References** - it is necessary to show where you found each piece of information. For example at the end of this assignment you are required to name the web site, textbook, etc) publisher, author, date

of publication and page number) Relate this information back to each part of the text as 1. 2.3. 4. etc.

Notes

- *Don't copy the work word for word you must use your own words.*
- *Assignments not handed in on time will be dealt with according to the school assessment policy statement given to you.*

CIVIL STRUCTURES

Task No.1 Date due: ___/___/___

Marks 25

Historical and Technological Changes in Bridge Design

1.1 The first bridge was probably a fallen tree across a river or rock put together over a river for crossing. Give a brief history of the development of bridges (Use only one A4 page, including date developed and name of bridge and designer) 5

1.2 Develop a table headed "**TECHNOLOGICAL CHANGES IN BRIDGE SYSTEMS**". It is to outline all the main types of bridges and include the flowing headings: (Use no more than two A4 pages oriented in landscape) 10

TECHNOLOGICAL CHANGES IN BRIDGE SYSTEMS									
Type	Date	History of Development	Material Used	Reason for material	Material properties	How was it manufactured	Bridge Picture/sketch	Advantages of design	Disadvantages of design
1.									
2.									
3.									
4.									
Etc.									

Engineering Innovations in Civil Structures and their Impacts

1.3 Invention is the development of something entirely new. Innovation means making an alteration to something that has already been invented, and improved upon it.

Find a new material or technology that is being used and describe what it is and where it is being used. Diagrams will help 5

5

Environmental Implications of Materials used in Civil Structures

1.4 Outline the Properties and Environmental Implications of the flowing Materials used in Civil Structures. 5

a) Timber
b) Stone
c) Bricks
d) Cast and Wrought iron and Steel
e) Concrete

CIVIL STRUCTURES

Task No.2 Date due: ___/___/___

The Scope of the Civil, Structural and Geotechnical Engineering Profession **Marks 15**

2.1 How do you become a Civil, Structural and Geotechnical Engineering? 5
(List universities, courses, length of courses and costs)

2.2 What types of companies employ Civil, Structural and Geotechnical Engineering? 5
(Find one advertisement for one of the above engineers and list company names)

2.3 What do Civil, Structural and Geotechnical Engineering do? 5

CIVIL STRUCTURES

Task No.3 Date due: ___/___/___

Engineering Mechanics and Truss Analysis **Marks 55**

BRIDGE HISTORY AND DESIGN: *(7)*

1 Explain what a beam is?..... 1
2 Explain the difference between a tied arch and an arch..... 1
3 Why are suspension bridges usually lighter than equivalent span arch bridges? 1
4 What made cast iron appealing as a bridge building material?..... 1
5 What is significant about the Brooklyn (USA) Bridge in terms of suspension bridge design?
..... 1
6 Why was the mass production of steel an important development in bridge design? 1
7 Why is concrete so popular in bridge construction?..... 1

A few links for concrete. The pictures show the processes used. might be of usein your tasks ...

http://www.concretenetwork.com/post-tension/

http://en.wikipedia.org/wiki/Prestressed_concrete

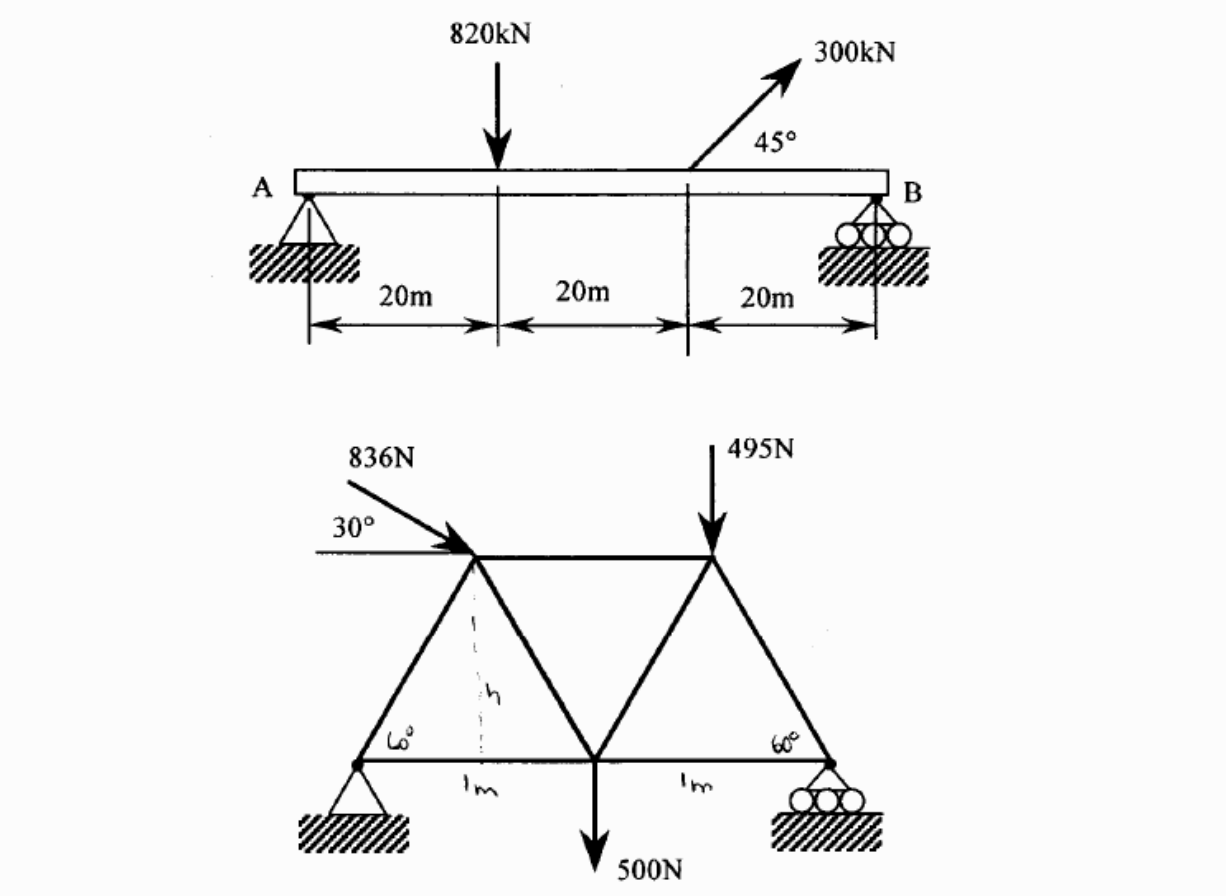
http://www.post-tensioning.org/application_bridges.php

also, engineering connections (dvd by the bbc) has a section on reinforcing concrete slabs. only a few minutes long but shows the benefits of reinforcing (based on taipei 101). also, the dvd has a section on forming concrete as used in the construction of the troll a oil platform.

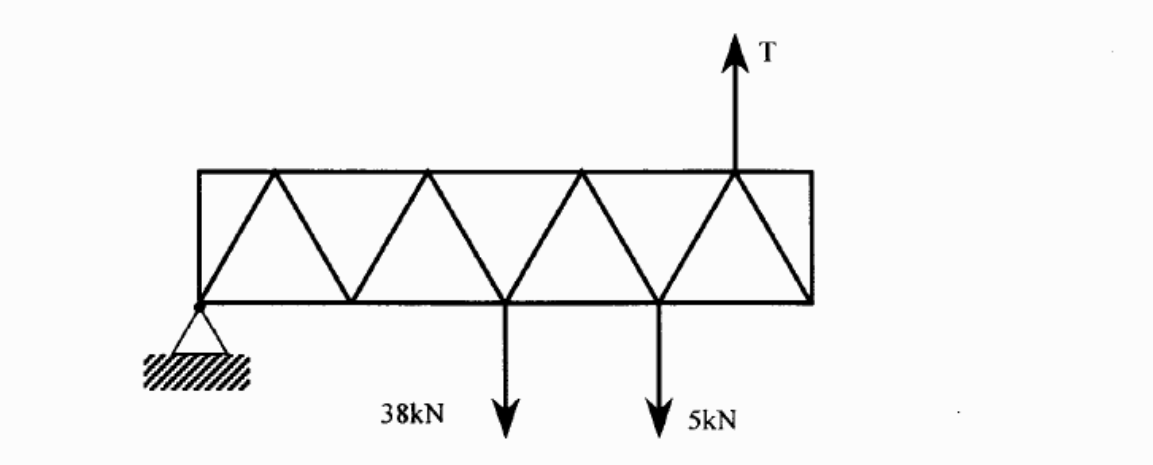
STRESS AND STRAIN CALCULATIONS:

TRUSS ANALYSIS:

10 Find the reactions for the following beam and truss? 10

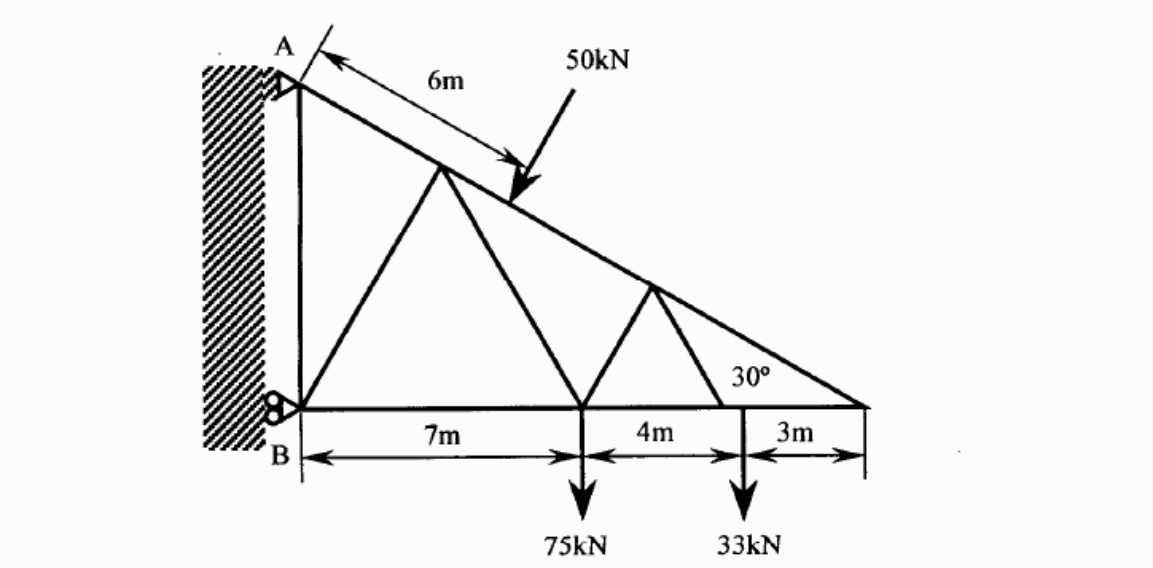


11. A truss for a gantry is anchored at one end and supported by a cable on the right hand end. Find the tension in the cable and the reaction at the support.

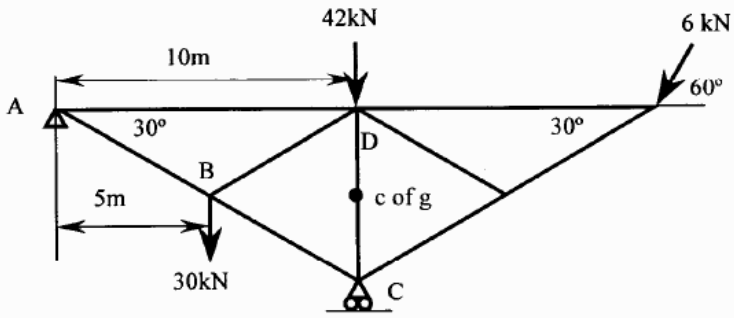


..... 5

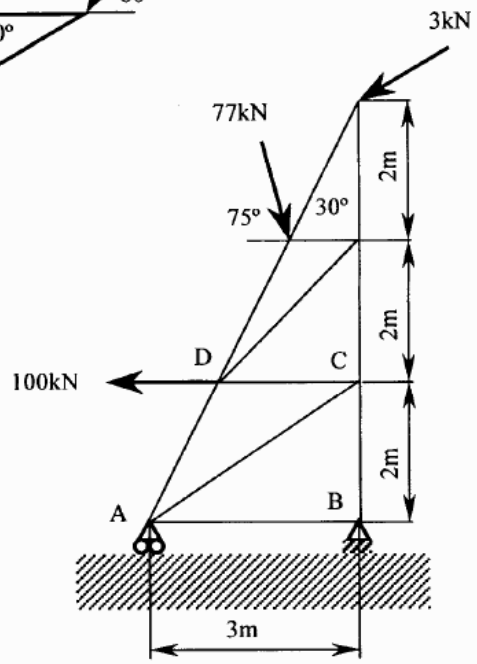
12.A triangular frame, shown below, is loaded as shown. Find the reactions at the supports and the force in member AB.



..... 5



Question 19

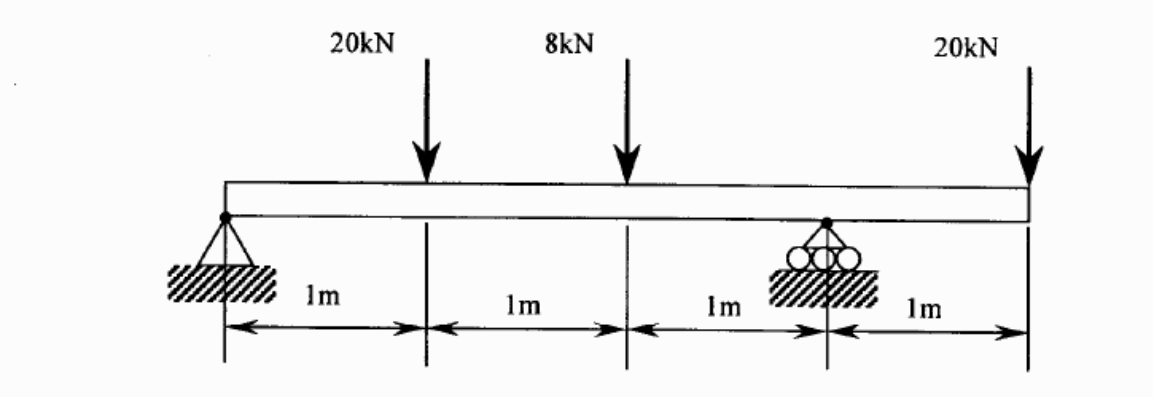


Question 20

13. Find the reactions at the supports for the 5 tonne truss, and the force in members BC and BD…..5
14. Find the reactions at the supports and the force in member DC
..... 5

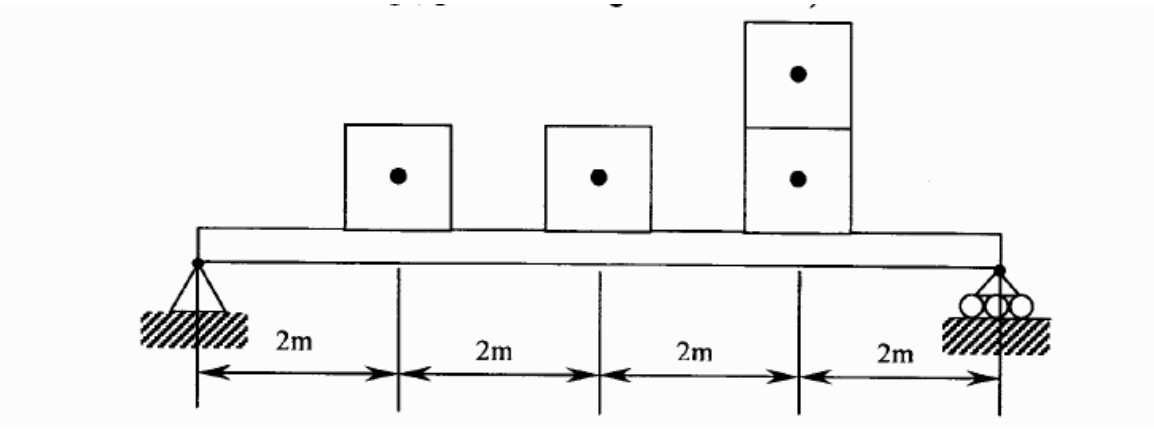
SHEAR FORCE AND BENDING MOMENT DIAGRAMS:

15. Produce the shear force and bending moment diagrams for the beam below



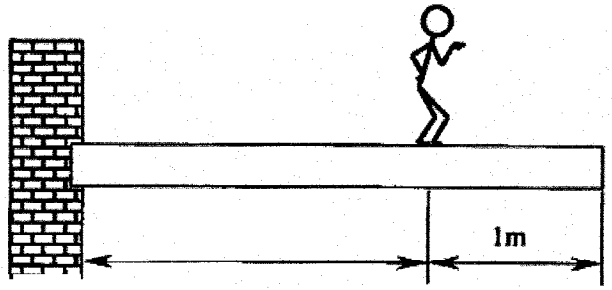
... 10

16. Draw the shear force and bending moment diagram for the beam below if each box has a mass of 25 kg (Ignore the weight of the beam)



... 10

17 Draw the shear force and bending moment diagrams for cantilever if a 80kg person is standing 1 m from the free end 10



CIVIL STRUCTURES

Task No.4 Date due: ___/___/___

Materials Science **Marks 40**

CRACK THEORY AND TESTING OF MATERIALS: *(10)*

Why is the critical crack length of a material important? 2
Why is cracking more likely to occur once a crack has started to form? 2
What is an interface in relation to cracking? 3
Explain the procedures of X-ray, dye penetration and ultrasonic testing 3

CERAMICS AND COMPOSITES: *(18)*

Define glass 1
What materials are used to make glass? 1
What is toughened glass? 1
What is the difference between cement and concrete? (and draw a microstructure of concrete label the important features) 3
Explain what mortar is 1
What is the reason for reinforcing concrete? (and describe the steel and concrete mechanical properties) 3
Describe the two types of pre-stressed reinforced concrete (and what is post-stressed concrete mean?) 3
Explain what asphalt is 1
How does laminated glass differ from normal glass[7] 1
What is a geotextile? (and also state where geotextiles are used) 3

CORROSION: *(12)*

Describe what is meant by the term corrosion 3
Explain the difference between oxidation and reduction 3
Explain the three types of galvanic corrosion 3
How may steel structures be protected from corroding? 3

CIVIL STRUCTURES

Task No.5 Date due: ___/___/___

Graphical Communication - Development of Transition Pieces **Marks 20**

Complete the following Exercises from your class textbook; "OTEN-Distance Education" Notes Part 4 Civil Structures – Communication pages 33-40
https://drive.google.com/file/d/0B2QQ8PNEf2zZdUZtbU0tTjhhczg/view?usp=sharing

6.1 Exercise 4.1 (page 33) *(4)*

6.2 Exercise 4.3 (page 35) *(4)*

6.3 Exercise 4.5 (page 37) *(4)*

6.4 Exercise 4.7 (page 39) *(4)*

6.5 Exercise 4.8 (page 40) *(4)*

CIVIL STRUCTURES

Task No.6 Date due: ___/___/___

Team Work – Spaghetti Bridge Design (80 marks)

You are required to work in group (2 people maximum) to build a Spaghetti Bridge.

The dimension is as follows:

- 20 and 30 cm long and between 3 and 8 cm high

Details of instruction are in the next page.

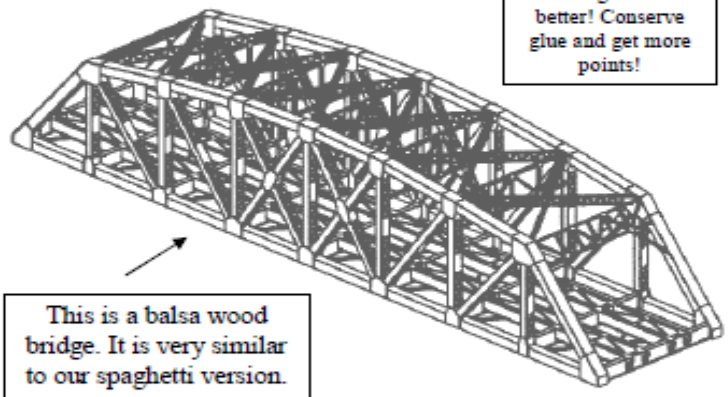
Overview:
Spaghetti Bridge Design Project

You and a partner will be building a bridge that you designed out of spaghetti! Once you have built your bridge, we will weigh it, then we will use **destructive testing** to determine your success.

In reality, we want our bridges to be very strong, but easy and inexpensive to build.
Therefore, your grade will be determined by:
-Overall weight of your completed bridge (dead load)
-Weight that your bridge holds up (live load)

The team with the ***lightest, strongest*** bridge
will receive the highest grade and a prize!!!!!

The lighter the better! Conserve glue and get more points!



This is a balsa wood bridge. It is very similar to our spaghetti version.

Things To Consider:
Your bridge will have four main parts.
- Two sides,
- a bottom (the roadway),
- and a top!

We will build these parts flat, and then assemble them into a 3D bridge- similar to the 4 walls of a house.

How To Be Successful:

Work together with your partner! There is more than enough work to be done. Many hands make light work, so let's go!

Build carefully. Each piece counts. Your bridge may hold significantly more if it is symmetrical in both design and construction.

If you have a weak side, the force of the test will crush that side first, and it will pull the good side down with it!

Safety Concerns:

Remember these few rules and you'll be fine:

- Hot Glue is HOT! It burns you!
- No sliding on the floor (you could fall face-first into a machine or vice)
- Clean up after yourself!
- Sharp tools will help you trim your spaghetti, but they will also trim your fingers! Be aware!

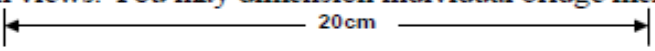
SPAGHETTI BRIDGE DESIGN PROJECT

Step 1: Choose a design/pattern for your truss bridge. You may use a successful design from West Point Bridge Design or an existing bridge.

Step 2: On graph paper, draw the side view of your truss bridge. Draw it so that it is between 20 and 30 cm long and between 3 and 8 cm high.

Step 3: On a separate sheet of graph paper, draw the top and bottom (roadway) of your bridge design. You may choose any pattern for this (XXXX or /\/\/\/\). Just remember, triangles are strong!
For "curved" trusses, ask your instructor for help.

Step 4: Once your drawings are complete, add dimensions to them. Dimensions are a system of measurements on a drawing that tell us the size of objects. Minimum required dimensions are: length and height of side, top and bottom views. You may dimension individual bridge members if you wish.



Step 5: Tape your graph paper (side view) to a piece of cardboard. Then, cover your drawing in wax paper and tape it down. This will allow you to see your bridge drawing and build on top of it without ruining it.

Step 6: Build two sides of your bridge. Once you have two identical sides (left and right side of the road), you can build the bottom.

Step 7: Build the bottom of your bridge.

Step 8: Assemble the left, right and bottom sides of the bridge.

Step 9: Verify your design for the top of the bridge is accurate. If so, build it.

Step 10: Attach top to other three sides.

Step 11: Weigh your bridge: _____grams.

Step 12: Test your bridge. Your bridge held_____grams. (LOAD)

Step 13: Determine your success ratio:

$$\frac{\text{Weight of Bridge}}{\text{Load}} =$$

TYPES OF TRUSSES