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CIT Semester 1 Examinations 2018/19

Note to Candidates:	Check the Programme Title and the Module Description to ensure that you have received the correct examination. If in doubt please contact an Invigilator.
Module Title:	**Maths for Technology**
Module Code:	**MATH6023**
Programme Title(s):	BSc in Construction Y1 BSc Hons Quantity Surveying Y1 BSc Hons Construction Mgmt Y1
Block Code(s):	**CCONS_7_Y1** **CQTSU_8_Y1** **CCNMG_8_Y1**
External Examiner(s):	**Dr. James Cruickshank**
Internal Examiner(s):	Ms. Katie Bullen, Mr. Donal O Shea
Instructions:	Answer one question from Section A. Answer any three questions from Section B. Please show all your calculations and workings.
Duration:	2 Hours
Required Items:	Log/Formulae Tables

Section A

(Compulsory)

1. The table below shows the compressive strength of 50 samples of concrete:

Compressive strength (N/mm^2)	Number of samples
18 but less than 22	5
22 but less than 24	9
24 but less than 30	12
30 but less than 34	10
34 but less than 40	9
40 but less than 50	5

(i) Represent this data by a histogram.

(ii) In which class does the median lie? Justify your answer.

(iii) Calculate the mean compressive strength of the 50 samples.

(iv) Calculate the standard deviation from the mean, correct to two decimal places.

[25 marks]

Section B

2. (a) Simplify the following, giving your answer in both scientific notation and decimal form.

$$\frac{(8 \times 10^{-2})(\sqrt{2.5 \times 10^{7}})}{(4 \times 10^{2})(5 \times 10^{-4})}$$

[3 marks]

(b) The plans for a hall were drawn to a scale of 1:250, if the actual dimensions of the hall were 52 metres by 38 metres, what were the dimensions of the hall on the plans, in millimetres? [5 marks]

(c) A triangular plot of land has sides of 200 metres, 175 metres and 125 metres.

(i) Calculate the area of this plot, correct to the nearest square metre.

(ii) Bill has estimated the area of the plot to be 10,000 m^2. Calculate the relative percentage error in Bill's estimation, correct to two decimal places.

[9 marks]

(d) (i) A rectangular garden has an area of 75 m^2, what is its area in mm^2?

(ii) The volume of a cylindrical tank is 240,000 cm^3, what is its volume in m^3? [4 marks]

(e) The price per night of a room in a hotel last September was €120 including 9% VAT. After the budget the VAT rate increased to 13.5%. By how much did the price of a room increase after this change in the VAT rate? [4 marks]

3. (a) Solve for x in each of the following equations:

(i) $\frac{3}{8}(5x-2)-\frac{3}{4}(4x-5)=2.$

(ii) $3x^2-13x-10=0.$

(iii) $8^{2x-3}=4^{x+2}.$ [13 marks]

(b) The formula for the volume of a sphere is given below:

$$V=\frac{4}{3}\pi r^3$$

(i) Make r the subject of the formula.

(ii) Find r when $V = 1500$ cm^3. [6 marks]

(c) Solve for p and q in the following pair of simultaneous equations:

$$2.2p+3.5q=32$$
$$5.5p-2.4q=13.1$$

[6 marks]

4. (a) Graph the function $f(x)=4x^2-4x-15$ in the domain $-3\leq x\leq 4$.

Use the graph to estimate:

(i) The roots of $4x^2-4x-15=0$.

(ii) The roots of $f(x)=22.5$.

(iii) The value of $f(1.5)$.

[14 marks]

(b) Given a line Q with an equation $5x-4y=20$

(i) If the line Q contains the point $(3,b)$, find the value of b.

(ii) What is the slope of the line Q?

(iii) What are the coordinates of the point where Q crosses the y-axis?

(iv) Find the equation of the line R which is perpendicular to Q and passes through the point $(2,-3)$. [11 marks]

5. (a) A solid concrete bollard is in the form of a frustum of a cone. It has a perpendicular height of 0.6 metres and its radii are 0.4 metres and 1.2 metres. Calculate:

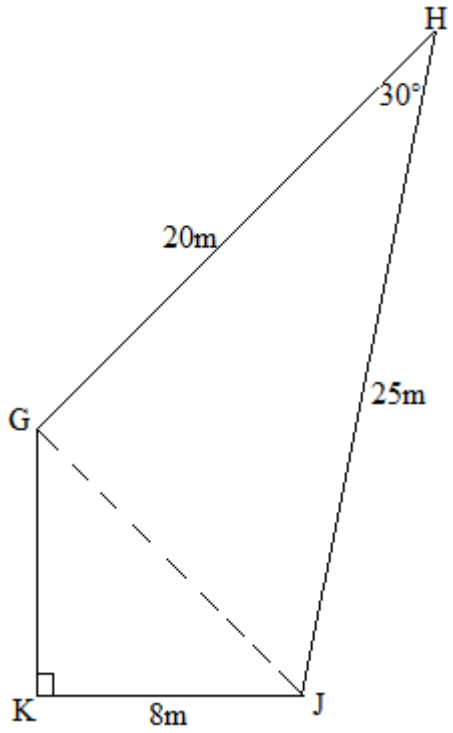
(i) The volume of the bollard, correct to three decimal places.

(ii) The slant height of the bollard.

(iii) The total surface area of the bollard, correct to two decimal places.

[11 marks]

(b) The quadrilateral *GHJK* is shown below, with $|GH| = 20$ metres, $|HJ| = 25$ metres, $|KJ| = 8$ metres and $|< GHJ| = 30^o$.



(i) Calculate $|GJ|$, correct to one decimal place.

(ii) Calculate $|GK|$, correct to one decimal place.

(iii) Calculate $|< KGJ|$, correct to one decimal place.

(iv) Calculate the area of the quadrilateral.

[14 marks]

Statistical Formulae

Mean ($\bar{x}$)

$$\bar{x} = \frac{\sum fx}{\sum f}$$

Standard deviation (σ)

$$\sigma = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2} \quad or \quad \sigma = \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}}$$