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1704/102  
MATHEMATICS I AND  
PHYSICAL SCIENCE  
Oct./Nov. 2018  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
CRAFT CERTIFICATE IN BUILDING TECHNOLOGY  
MODULE 1

MATHEMATICS I AND PHYSICAL SCIENCE

3 hours



INSTRUCTIONS TO CANDIDATES

*You should have the following for this examination:*

- Answer booklet;*
- Drawing instruments;*
- Mathematical tables/Scientific calculator.*

*This paper consists of EIGHT questions in TWO sections; A and B.*  
*Answer a total of FIVE questions; taking at least TWO questions from each section.*  
*All questions carry equal marks.*  
*Maximum marks for each part of a question are as indicated.*  
*Candidates should answer the questions in English.*

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**This paper consists of 5 printed pages.**

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**



## SECTION A: MATHEMATICS I

Answer at least **TWO** questions from this section.

1. (a) Solve for  $x$  in the following equations:

(i)  $\log_x 2 + \log_x 2 = 2$  (4 marks)

(ii)  $4^x - 6(2^x) - 16 = 0$  (4 marks)

(b) Simplify:

(i)  $\left(\frac{125}{27}\right)^{-\frac{2}{3}}$  (4 marks)

(ii)  $\frac{x^{-\frac{1}{2}}(x-1)^{\frac{1}{2}} + x^{\frac{1}{2}}(x-1)^{-\frac{1}{2}}}{x^{\frac{1}{2}}}$  (4 marks)

(iii) Show that  $\log_a b + \log_a c = \log_a bc$  (4 marks)

2. The lengths of 70 bars were measured and the following frequency distribution obtained.

Length ( $x$ ) mm	21.2 - 21.4	21.5 - 21.7	21.8 - 22.0	22.1 - 22.3	22.4 - 22.6	22.7 - 22.9	23.0 - 23.2
Frequency ( $f$ )	3	5	10	16	18	12	6

(a) Use an assumed mean of 22.2 to calculate:

- (i) the mean; (10 marks)
- (ii) the standard deviation.

(b) (i) Draw a histogram and use it to calculate the mode. (9 marks)

(ii) State the modal class. (1 mark)





3. Figure 1 shows a square based pyramid VABCD, with a perpendicular height  $VO = 6$  cm and the slant edges  $VA = VB = VC = VD = 10$  cm.

Calculate:

- (a) total surface area of the pyramid; (9 marks)  
 (b) total volume of the pyramid; (3 marks)  
 (c) angle VBC; (4 marks)  
 (d) angle VAO. (4 marks)

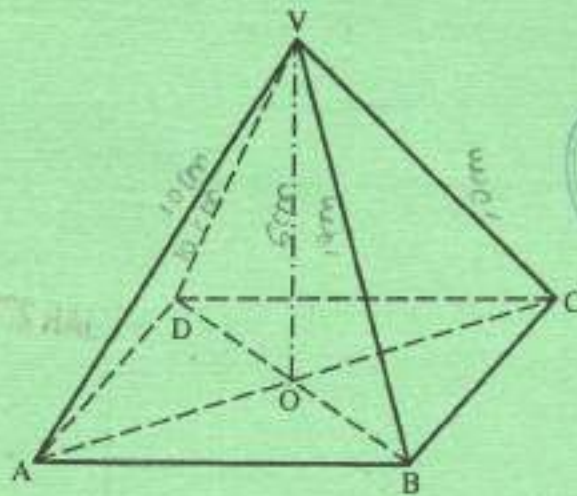


Fig. 1

4. (a) Solve for  $x$  and  $y$  in the equations:

$$\begin{aligned} xy &= 80 \\ \log x - 2 \log y &= 1 \end{aligned}$$

(4 marks)

- (b) Solve the trigonometric equation  $2 - 5 \tan^2 \theta = 0$  for  $0^\circ \leq \theta \leq 360^\circ$  (4 marks)

- (c) Draw the graph of  $y = 2x^2 + 5x - 3$  for values of  $x = -4$  to  $x = 2$  and use it to solve the equations:

(i)  $2x^2 + x - 6 = 0$

(ii)  $2x^2 + 3x + 4 = 0$

(6 marks)



- (d) The 8th term of an A.P. is 11 and the 15th term is 21. Calculate:
- the common difference;
  - the first term of the series;
  - the  $n^{\text{th}}$  term of the series.

(6 marks)

## SECTION B: PHYSICAL SCIENCE

*Answer at least TWO questions from this section.*

5. (a) Define the following terms:

- alkali;
- base;
- acid;
- anhydrous salt;
- hydrated salt.



(10 marks)

- (b) State
- five**
- disadvantages of friction.

(5 marks)

- (c) Calculate the density of a rock with a volume of
- $15 \text{ cm}^3$
- and a mass of 45 g.

(5 marks)

6. (a) Define the following terms:-

- centre of gravity;
- couple.

(4 marks)

- (b) State the
- three**
- Newtons laws of motion.

(6 marks)

- (c) Describe the composition of an atom.

(6 marks)

- (d) A swimming pool of width 9.0 m and length 24.0 m is filled with water to a depth of 3.0 m. Calculate the pressure on the bottom of the pool due to water. (Density of water
- $\rho = 1000 \text{ kg/m}^3$
- ).

(4 marks)



7. (a) Explain the following terms giving their SI units:

- (i) work;
- (ii) energy;
- (iii) power.

(6 marks)

(b) (i) Calculate the required force to make the following system be in equilibrium.

(4 marks)

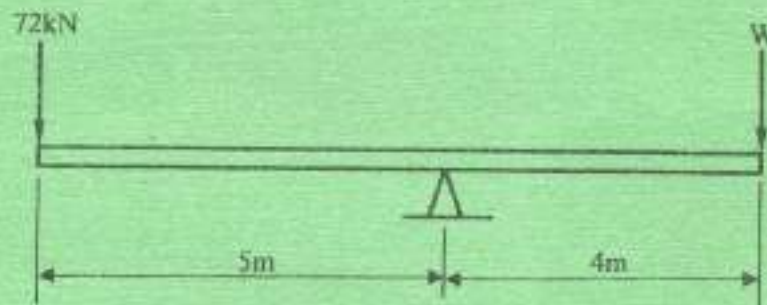


Fig. 2

(ii) A lorry of mass 6 tonnes is travelling at a speed of 60 km/h. Calculate its momentum.

(4 marks)

(c) A brick has a dimension of  $30 \times 30 \times 20$  cm and has a mass of 3 kg. Calculate the maximum and minimum pressure exerted on a bench by the brick.

(6 marks)

8. (a) Define the following terms:-

- (i) mixture;
- (ii) compound;
- (iii) force.

(6 marks)

(b) A string has a diameter of 2 mm when a force of 100 N is applied. Determine the stress.

(6 marks)

(c) State four types of forces.

(6 marks)

(d) State Hooke's law.

(2 marks)



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