1704/202
MATHEMATICS II
June/July 2018
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN BUILDING TECHNOLOGY

MODULE II

MATHEMATICS II

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
  Answer booklet;
  Mathematical tables/scientific calculator.
*This paper consists of **EIGHT** questions.*
*Answer **FIVE** questions.*
All questions carry equal marks.
Maximum marks for each part of a question are indicated.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

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

Turn over

1. (a) There are 3 red and 5 green balls in a bag. Two balls are picked one at a time without replacement. Find the probability of picking:

(i) different colours;

(ii) same colours;

(iii) red then green. (10 marks)

(b) Two dice are tossed together. What is the probability that the sum of the numbers showing on their upper faces is:

(i) 5;
(ii) 6;
(iii) odd;
(iv) even. (10 marks)

2. (a) In triangle PQR, angle PRQ is 39°, PR = 15 cm, and QR = 18 cm. Calculate:

(i) PR;

(ii) angles PQR and QPR;

(iii) the area of the triangle. (10 marks)

(b) Solve $4\sin\theta + 3\cos\theta = 2$, for value of $0 \le \theta \le 360°$. (10 marks)

3. Table 1 shows the frequency distribution table of the ages of 60 engineering students.

Table 1

Ages	Number of students
15 – 19	2
20 – 24	22
25 – 29	15
30 – 34	12
35 – 39	8
40 – 44	0
45 – 49	1

(a) Find the modal class;

(b) Calculate the mean;

(c) Draw an ogive curve, then use it to estimate the median. (20 marks)

4. (a) Solve for a and b:

$$\begin{pmatrix} a-5 \\ b+2 \end{pmatrix} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}.$$ (4 marks)

(b) If $A = \begin{pmatrix} 5 & -3 \\ 6 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -11 & 9 \\ 3 & 7 \end{pmatrix}$, find $3A + 2B$. (4 marks)

(c) Find the inverse of the matrix $\begin{pmatrix} 4 & -5 \\ 7 & 4 \end{pmatrix}$. (4 marks)

(d) Use matrix method to solve the simultaneous equations:

$2x + 5y = -11$

$x - 3y = 11$ (8 marks)

5. (a) Differentiate the following:

(i) $y = 3x + \frac{1}{2}$; (2 marks)

(ii) $y = (3x + 1)(x^2 - 4)$; (3 marks)

(iii) $y = 2x \cos 3x$; (3 marks)

(iv) $y = \frac{x^3}{\sin 2x}$. (4 marks)

(b) Distance covered by an object after t seconds is $s = \{3t(4 - t)\} + 7$ metres. Find:

(i) the velocity, after 1 second;

(ii) the acceleration;

(iii) the distance covered after 2 seconds. (8 marks)

6. (a) Integrate the following:

(i) $\int x^2 \, dx$; (1 mark)

(ii) $\int \frac{x^2 - 5x + 6}{x - 2} \, dx$; (5 marks)

(b) Evaluate $\int_1^2 (5x - 1) \, dx$. (4 marks)

(c) Plot the curve $y = 2x^2 + 5x - 6$ and the line $7y = 20x + 80$ and shade the area enclosed. (10 marks)

7. (a) If $p = \begin{pmatrix} -3 \\ 7 \end{pmatrix}$ and $q = \begin{pmatrix} 2 \\ -9 \end{pmatrix}$, find $2p - 3q$. (4 marks)

(b) Determine the length of the vector $\begin{pmatrix} 5 \\ 9 \\ 2 \end{pmatrix}$. (2 marks)

(c) **Figure 1** shows triangle PQR. $QP = a$ and $QR = b$ and A lies on PR such that PA:AR = 2:3. Express the vector OA in terms of a and b.

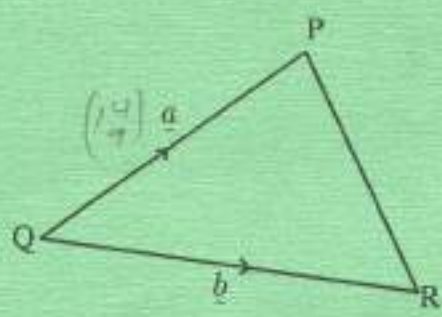**Fig. 1** (4 marks)

(d) Given $a = \begin{pmatrix} 14 \\ 7 \end{pmatrix}$, find its magnitude and direction. (5 marks)

(e) Resolve the vector $b = (6, 120°)$ into the horizontal and vertical components. (5 marks)

8. (a) Otieno buys cars in Japan and sells in Germany. During one month he bought and transported 27 Toyota cars at a cost of 275,000 Japanese Yen each. At what price must he sell each car in Germany if he wishes to make a profit of 15%. 25.523 German Duetchmark = 208.166 Japanese Yen. (6 marks)

(b) A man bought land at Ksh 729,000. He then subdivided the land into three portions and sold them at Ksh 410,000, Ksh 931,000 and Ksh 195,000 respectively. Calculate his percentage profit. (4 marks)

(c) A lady took a bank loan of Ksh 392,000 to be paid after 3 years at a compound interest of 13% per annum. Determine the total amount she paid back. (4 marks)

(d) John had 5,100 US dollars. He exchanged the dollars into Kenya shillings. He spent Ksh 135,000 then converted the balance to US dollars. Calculate how much US dollars remained, given that 1 US dollar is Ksh 101. (6 marks)

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