**NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ INDEX NO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DATE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ SIGNATURE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3KNT FRATERNITY 2017**

**TERM II FORM IV EXAM**

**MATHEMATICS PAPER II**

**121/2**

**TIME: 21/2 HOURS**

**Instructions to candidates**

1. Write your name and index number in the space provided above
2. Sign and write the date of exam in space provided above
3. This paper consists of two sections section 1 and section II
4. Answer all the questions in section 1 and any five questions from section II
5. All answers and working must be written on the question paper in the space provided below each question
6. Non programmable silent electronic calculator and KNEC mathematical table may be used except where stated otherwise.

|  |  |  |
| --- | --- | --- |
| SECTION I | SECTION II | GRAND TOTAL |
|  |  |  |

**SECTION I ( Answer all question in this section)**

1. Use logarithms to evaluate (4mk)

43.58 + 16.73

√5.251 x 0.06594

2.Make x the subject of the formula. (3mks)

V =$∛\left(\frac{ax^{2}h}{b-h}\right)$

3. Kijana Manyaga bought a new Tonando Motor bike at kshs. 80,000 last year. If Kijana manyaga was to sell the Tnando motor bike after 2 years time and the rate of depreciation is 15% semi-annually, what will be the value of the Tonando motor cycle (3mks)

4. Find the value of x given that

Log (15-5x) -1 = log(3x-2) (3mks)

5. Draw a line AB=5.2cm, construct the locus of a point P such that <APB=500 on one side of AB and that P is equidilaterlal from A and B. (4mks)

6. Solve for θ in tan (2θ + 45) = √3 for -90o≤θ≤90o  (3mks)

7. Simplify $\frac{3}{\sqrt{2}+√5}-\frac{2}{\sqrt{2}-√5}$ given your answer in form of a√b + c√d (3mks)

8(a) Using binomial expansion theorem expand, (2 - $\frac{2}{x}$) 6 up to the forth term (1mk)

(b) Use your expansion in above to evaluate (1.76)6 correct to 4 s.f (2mks)

9. A curve is given by the equations y=5x3-7x2+3x+2

Find the

1. Gradient of the curve at x=1 (2mks)
2. Equation of the normal line to the tangent at point (1,3) (2mks)

10. Find the radius and coordinates of the centre of the circle (3mks)

**2x2+2y2-6x+18y-7=0**

11. Vector **OP**=6**i**+2**j** and **OQ**= -3**i**+5**i**. A point N divides PQ externally in the ratio **5 : -2.** Find PN interms of **i** and **j**  (3mks)

12. If P varies directly as Q and inversely as T. Find the percentage change in P if Q decreases by 20% and T increases by 25% (3mks)

13. The length and width of a rectangle measured to the nearest milimetre are 7.5cm and 5.2cm respectively

Find to 4 s.f the percentage error in the area of the rectangle (3mks)

14. In the figure below XT is a tangent to the circle at x. PMQT and XMY are straight lines. Given that XY=14cm,MX=8cm, PM=4cm and QT=10cm.

 Y

4cm

 M 10 cm

 P Q T

M

8cm

 X

Find the length of

1. MQ (1mk)
2. XT (2mk)

15. When ksh 40,000 was invested in a certain bank for 5 years, it earned a simple interest of ksh 3800. Find the amount that must have been invested in the same bank at the same rate for 71/2 years to earn a simple interest of ksh 3420 (3mks)

16. Integrate $\frac{X^{3}-X^{2}-6X}{X}$ (2mks)

**SECTION II (Attempt ony five questions in this section)**

17a. Complete the table below

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Xo  | **0** | **30** | **60** | **90** | **120** | **150** | **180** | **210** | **240** | **270** | **300** | **330** | **360** |
| 2sin (x+30)0 | **1** | **1.73** | **2.00** | **1.73** | **1.00** |  | **-1.00** | **-1.73** |  | **-1.73** |  | **0.00** | **1.00** |
| 1-2cos(2x)0 | **-1.00** | **0.00** |  | **3.00** |  | **0.00** | **-1.00** |  | **2.00** |  | **2.00** |  | **-1.00** |

 b. On the same axes plot the following curves (5mks)

1. Y=**2sin (x+30)0**
2. Y=**1-2cos(2x)0**

Use the scale 1cm rep.300 on x-axis and 1cm rep. 0.5 units on y-axis

****

c. Use your graph to find the values of x

1. At the point where the curves intersect (2mks)
2. Where **2 sin (x+30)0 = -1.5**  (1mk)

 18. The table below shows tax rates in 2012

|  |  |
| --- | --- |
| Income in K£ P.A | Rate of tax in % |
| 1-5208 | 10 |
| 5209-9744 | 15 |
| 9745-14292 | 20 |
| 14293-18840 | 25 |
| Over 18840 | 30 |

 An employee pays kshs. 5400 as PAYE monthly. She is entitled to a house allowance of kshs. 9,000 per month and claims a monthly tax relief of kshs 1093. Calculate

1. His gross tax per year (2mks)
2. His monthly basic salary (6mks)

c).He also has monthly contributions as follows

1. Cooperative society contributions shs. 2000
2. Loan repayment shs. 2500

Calculate his net salary per month. (2mks)

19. In the figure below **OA**= **a** **OC** = **b** , OP:PB=3:2 and AP:PC=4:3

O

C

P

A

B

a. Express in terms of **a** and **b**

1. **AC** (1mk)
2. **OP** (4mks)
3. **OB** (3mks)

b.Hence obtain the value of h and r if **OB** =h **a** + r **b**  (2mks)

20. The figure shows a frustum ABCDEFG

 E E

 H HHHHH H

 8c8 8cm

 G G G

F

 F

D D

 26CM 226CM2 26cm

AA

 24cm 24cm

 C C

 18cm

B

Given that AB=24cm, BC=18cm,EF=8cm and GC=26cm, calculate

a. The length of the diagonal

1. AC (1mk)
2. EG (1mk)

b. The perpendicular height of the frustum (2mks)

1. .Find the angle made by
2. Line AG and plane ABCD (2mks)
3. Line AE and plane ABCD (2mks)
4. Plane ABCD and plane ABGH (2mks)

21. A basket contains two green oranges, three yellow oranges and 5 red oranges. Two oranges are drawn one at a time without replacement

1. Draw a tree diagram to show all the possibilities (2mks)
2. Find the probability that
3. The two oranges are of the same colour (3mks)
4. The two oranges are red (2mks)
5. Atleast one of the oranges is green (3mks)

22. A quadrilateral ABCD has vertices A(4,-4), B(2,-4), C(6,-6) D(4,-2)

a).On the grid provided draw the quadrilateral ABCD (1mk)



b).A’B’C’D’ is the image of ABCD under a matrix $\left(\begin{matrix}0&-1\\1&0\end{matrix}\right)$ on the same grid, draw the image A’B’C’D’Describe the transformation fully (4mks)

c).A’’B’’C’’D’’ is the image of A’B’C’D’ under the transformation given by the matrix $\left(\begin{matrix}1&-2\\0&1\end{matrix}\right)$

1. Determine the coordinates of A’’B’’C’’D’’ (2mks)
2. On the same grid, draw the quadrilateral A’’B’’C’’D’’ (2mks)

d).Determine a single matrix that maps ABCD onto A’’B’’C’’D’’ (2mks)

23. In the figure below PQR and S are points on the circle centre O. PRT and USTV are straight lines. Lines USTV is a tangent to the circle at S, <RST =50o and <RTV=150o

 Q

 P

O

 R

 U T

 S

a).Calculate the side of

1. <ORS (2mks)
2. <USP (1mk)
3. <PQR (2mks)

b).Given that RT=7cm and ST=9cm, calculate to 3 significant figures

1. The length of line PR (2mks)
2. The radius of the circle (3mks)

24. An arithmetic progression has the first term as a and the common difference as d

1. Write in terms of a and d, the 3rd, 9th and 25th terms of the progression (1mks)
2. The progression in increasing and the 3rd, 9th and 25th terms form the first three consecutive terms of a geometric series. If the sum of the 7th term and twice the sixth term of the arithmetic progression is 78, calculate

i) The first term and the common difference of the arithmetic progression (6mks)

ii) Find the sum of the first 9 terms of the A.P (3mks)