**NAME: ................................................................................... INDEX NO: ...........................................**

 **CANDIDATE’S SIGNATURE: ..........................**

 **DATE: ...............................................**

**121/2**

MATHEMATICS

JULY 2019

**PAPER 2**

**TIME: 2 ½ HOURS**

 **END OF TERM 2 2019 EVALUATION**

**INSTRUCTIONS TO CANDIDATES:**

(a) Write your name and index number in the spaces provided above

(b) Sign and write the date of examination in the spaces provided above.

(c) This paper consists of ***TWO*** sections: ***Section I*** and ***Section II.***

(d) Answer ***ALL*** the questions in ***section I*** and only five from ***Section II***

(e) All answers and working must be written on the question paper in the spaces provided below each

question.

(f) ***Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.***

(g) Marks may be given for correct working even if the answer is wrong.

(h) ***Non-programmable*** silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

**FOR EXAMINER’S USE ONLY**

**Section I**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **Total** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Section II**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **Total** |
|  |  |  |  |  |  |  |  |  |

 **Grand Total**

***This paper consists of 14 printed pages.***

***Candidates must check to ascertain that all pages are printed as indicated***

***and that no question(s) is/are missing.***

**SECTION I (50 MARKS)**

1. Evaluate without using Mathematical tables or a calculator. (3mks)

 

2. Solve for x given that the following is a singular matrix  (2mks)

3. Make b the subject of the formula a =  (3 mks)

4. Without using mathematical tables or calculators express in surd form and simplify

  (3 mks)

1. Agotho has a rectangular plot that was measured to the nearest meter and found to be 80m in length and 60m in width. Determine the percentage error in its perimeter. (3 marks)

6. Peter operates a printing firm and the cost of printing a book is partly constant and partly varies as the number as pages. If a book has 200 pages, the cost in sh 400 and if it has 100 pages, the cost is sh 240. Find the cost of printing a book with 400 pages. (4 mks)

7. A body starts from rest and after t seconds its velocity in ms-1 was recorded as shown below;

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| T in (sec) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Velocity | 0 | 0.29 | 5.4 | 7.7 | 9.7 | 11.4 | 12.7 |

Use the trapezoidal rule to estimate the distance covered by the body between 1 and 6 seconds (2 mks)

8. 14 people can build 10 huts in 30 days. Find the number of people working at the same rate that will build 18 similar huts in 27 days. (3mks)

9. A point M (60 °N, 18 °E) is on the surface of the earth. Another point N is situated at a distance of 630 nautical miles east of M.

Find:

1. the longitude difference between M and N; (2 mks)

 (b) The position of N. (1 mk)

10. (a) Expand  in ascending powers of x. (2mks)

 (b) Use your expansion up to the fourth term to evaluate 9.85. (2mks)

11. The equation of a circle center (a, b) is *x*2 – y2 – 6*x* - 10y + 30 = 0.

Find the values of a and b. (3 mks)

12. Solve for x in the equation √3 tan (x - 20)0 = –1, for 00 ≤ x ≤ 3600 (3mks)

13. Find the equation of the tangent to the curve $2x^{2}-8y=0$ at the point $\left(12,18\right).$ (3mks)

14. Transformations M and N are represented by the matrices;  and  respectively. Point R has co-ordinates (3, -2), find the co-ordinates of R1 the image of R under transformation represented by N followed by M. (3 mks)

15. A coffee dealer mixes two brands of coffee, x and y to obtain 40kg of the mixture worth Ksh. 2,600. If brand x is valued at Ksh. 70 per kg and brand y is valued at Ksh. 55 per kg. Calculate the ratio in its simplest form in which brands x and y are mixed. (4mks)

16. Given that y = 3 Sin ( $\frac{2}{5}x+30)$0 for 00 $\leq x \leq 360. Determine:$

1. Amplitude of the curve. (1 mk)
2. Phase angle of the curve (1 mk)
3. Period of the curve. (2 mks)

**SECTION II (50 MARKS)**

**Answer only five questions in this section**

17. (a Hellen’s earnings are as follows:

 Basic salary sh. 38000 per month

 House allowance sh. 14000 per months

 Travelling allowance sh.8500 per month and

 Medical allowance Ksh.3300 per month.

She is given a personal relief of Ksh. 12672 per annum

 The table for payable tax is shown below

 Income in K£ p.a Payable tax rate in Kshs per K£

 0-6000 2

 6001-12000 3

 12001-18000 4

 18001 -24000 5

 24001-30000 6

 30001-36000 7

 36001-42000 8

 42001-48000 9

 Over 48000 10

**Calculate**

 (i) Hellen’s taxable income in K£ p.a (2mks)

 (ii) Her P.A.Y.E (5mks)

 Hellen is deducted the following items per month

NHIF Ksh.320

 Cooperative shares Ksh.2000

 Loan repayment Ksh5000

 Determine her net salary per month (3mks)

18. The data below represent the heights taken to the nearest centimeters of 40 lemon trees in a garden. (NB: A = Assumed mean)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Height (cm) | f | x | d = x - A | fd | d2 | fd2 |
| 131 – 140 | 3 |  |  |  |  |  |
| 141 – 150 | 4 |  |  |  |  |  |
| 151 – 160 | 7 |  |  |  |  |  |
| 161 – 170 | 11 |  |  |  |  |  |
| 171 – 180 |  |  |  |  |  |  |
| 181 – 190 | 5 |  |  |  |  |  |
| 191 – 200 | 1 |  |  |  |  |  |

 a) Complete the table. (6 mks)

 b) Using 165.5 as the assumed mean, calculate the mean height. (2 mks)

 c) Calculate the standard deviation of the distribution. (2 mks)

19. An arithmetic progression (AP) has the first term a and the common difference d.

 (a) Write down the third, ninth and twenty fifth terms of the AP in terms of a and d. (1mk)

 (b) The AP above is increasing and the third, ninth and twenty fifth terms form the first three

consecutive terms of a Geometric Progression (G.P) The sum of the seventh and twice the sixth terms of the AP is 78. Calculate:-

(i) the first term and common difference of the AP. (5mks)

(ii) the sum of the first nine terms of the AP. (2mks)

(iii) The difference between the fourth and the seventh terms of an increasing AP. (2mks)

20.The figure below is a square based pyramid ABCDV with AD = DC = 6cm, and height VO = 10 cm.

**D**

**D**

**C**

**O**

**A**

**B**

**10cm**

**6cm**

**6cm**

**V**

1. State the projection of VA on the base ABCD. (1 mk)
2. Find
3. The length of VA (3 mks)
4. The angle between VA and ABCD (2 mks)

1. The angle between the planes VDC and ABCD (2 mks)
2. Volume of the pyramid (2 mks)

21. (a) Complete the table below for the function ***y = x2 + 3*** (2mks)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***x*** | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 |
| ***y*** | 4 |  | 7 |  |  | 15.25 | 19 |  | 27 |  | 39 |

 (b) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve, the line

 *x = 1* and the line *x = 6.* (2mks)

 (c) Use integration to find the exact area in (b) above. (3mks)

 (d) Calculate the percentage error arising from the use of mid-ordinate rule. (3mks)

22. A contractor applied for contracts

 A - Building a classroom block

 B - Constructing school dining hall

 C - Putting up a dormitory block

The probability of getting A is 0.7. The probability of getting B is 0.6 If A is obtained and only 0.3 if A is not obtained. The probability of getting C is 0.8 if B is obtained and only 0.4 if B is not obtained.

a) Draw a tree diagram to represent the above information. (2 marks)

 b) Find the probability of getting

 i) The three contracts (2 marks)

 ii) Only one contract (2 marks)

 iii) At least one contract (2 marks)

 iv) None of the contract (2 marks)

23. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the

circle. A, O, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC= 480 and angle CAD = 360.

**E**

**D**

**C**

**B**

**O**

**A**

**36o**

**48o**

**X**

1. Giving reasons or otherwise, find the value of the following angles:-
2. Angle CBA (1 mk)
3. Angle BDE (2 mks)
4. Angle CED (3 mks)
5. It is also given that AX = 12 cm, XC = 4 cm, DB = 14 cm and DE = 20 cm.

Calculate:

1. DX (2 mks)
2. AE (2 mks)

24. A tailoring business makes two types of garments A and B. Garment A requires 3 metres of material while garment B requires 2 ½ metres of material. The business uses not more than 600 metres of material daily in making both garments. It must make not more than 100 garments of type A and nor less than 80 of type B each day.

(a) Write down three inequalities from this information other than and , where x is the number of garments of type A and y the number of garments of type B. (3mks)

(b) Graph these inequalities. (3mks)



(c) If the business makes a profit of sh 80 on garment A and a profit of sh. 60 on garment B, how many garments of each type must it make in order to maximize the profit and what is the total profit? (4mks)

 *End*