

**MATH – Mathematics B**

**T081**

**Wednesday, 29/10/2014**

**08:30 - 11:30 AM**

WORKFORCE DEVELOPMENT AUTHORITY



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**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2014,  
TECHNICAL AND PROFESSIONAL TRADES**

**EXAM TITLE : Mathematics B**

**OPTIONS** : Electricity (**ELC**); Computer Electronics (**CEL**); Electronics and Telecommunication (**ETL**); Construction (**CST**); Public Works (**PWO**); Tailoring (**TAL**); General Mechanics (**GME**); Motor Vehicle Mechanics (**MVM**); Graphic Arts (**ART**), Ceramic Sculpture (**SCE**), Surveying (**SUR**).

**DURATION : 3hours**

**INSTRUCTIONS :**

The paper consists of **two (2) Sections** :

Section I: Twelve (**12**) questions, all **Compulsory**.

**55marks**

Section II: Five (**5**) questions, **Choose any Three (3)**.

**45marks**

**SECTION I. TWELVE (12) COMPULSORY QUESTIONS.**

- 01.** In a group there are 3 men and 2 women. Three persons are selected at random from this group. Find the probability that 1 man and 2 women or 2 men and 1 woman are selected. **5marks**
- 02.** The equation of a curve is  $y = 4x^2 - x^3$ . The gradient at the point M on the curve is 10. Find the equation of the tangent to the curve at M. **5marks**
- 03.** A. Sketch the graph of  $y = \cos x$ , for values of  $x$  from  $0^\circ$  to  $360^\circ$ . **2marks**  
B. Sketch, on the same diagram, the graph of  $y = \cos(x - 60^\circ)$ . **2marks**  
C. Use your diagram to solve the equation  $\cos x = \cos(x - 60^\circ)$ . **2marks**
- 04.** Find the values of  $k$  for which the equation  $x^2 + (k + 1)x + 1 = 0$  has **3marks**  
i) Two distinct real roots.  
ii) No real roots.
- 05.** Find a real number  $a$  such that  $z = -i$  is a root for the polynomial  $P(z) = z^3 - z^2 + z + 1 + a$ . Furthermore; for such value of  $a$  solve  $P(z) = 0$  in  $\mathbb{C}$ . **5marks**
- 06.** Prove that all points satisfying  $\left| \frac{z + 1}{z + 4} \right|$  lie on a circle. **5marks**  
Find its center and radius.
- 07.** The membership of a book club is made up of men, women and children. The total membership is 2400. Jacky is drawing a pie-chart to show the membership. **7marks**  
a) She uses an angle of  $150^\circ$  to represent the men. How many men are there?  
b) There are 800 women. What angle should Jacky use for the women?  
c) Draw a pie-chart to show the data.
- 08.** Solve in  $\mathbb{R}^2$  the following simultaneous equation :  $\begin{cases} 2\ln x + 3\ln y = -2 \\ 3\ln x + 5\ln y = -4 \end{cases}$  **4marks**
- 09.** Using integration by parts evaluate  $\int_1^e \frac{\ln x}{x^2} dx$  **4marks**

10. Mary asks 200 students, which of these types of music they listen to : pop; **5marks**

Jazz; and classical. Her results are:

90 students listen to classical;

123 students listen to pop;

69 students listen to jazz;

53 students listen to both classical and pop;

27 students listen pop and jazz;

34 students listen classical and jazz;

15 students listen to all three.

Using the Venn diagram; write down the number of students who :

a) Listen to classical music only;

b) Do not listen to any of the three types of music.

11. Find the shortest distance from the origin to line  $3x + 4y = 15$

**3marks**

12. Three numbers are in arithmetic progression. Their sum is 15 and their product is 80. Determine the three numbers.

**3marks**

### SECTION II. ATTEMPT ANY THREE (3) QUESTIONS.

13. Solve the following equations :

**15marks**

a)  $\ln(2x + 3) + \ln(-5x + 4) = \ln(-7x + 2)$

b)  $z^4 - (8i - 1)z^2 - 8i = 0$

14. The following table gives a number of advertisement spots ( $X_i$ ) and the volume of sales in hundreds of dollars ( $Y_i$ ) of a certain company.

**15marks**

$X_i$	$Y_i$
1	41
2	50
3	54
4	54
5	67
6	63

a) Calculate the standard deviation for  $X_i$  and  $Y_i$ ;

b) Calculate the correlation coefficient  $r$

c) Find the equation of regression line for  $y$  with respect to  $x$ ;

d) If the volume of sales is 65, estimate the number of advertisements spots for 7 number of advertisements.



15. The vertices of the triangle are A(1,2,3); B(-2,1,-4) and C(3,4,-2)

15marks

- Find perimeter of the triangle (A,B,C)
- Determine the coordinates of centre of gravity of the triangle (A,B,C)
- Find the angles of the triangle (A,B,C)
- Find area of the triangle (A,B,C).

16. Given the function  $f$  of real variable  $x$  defined by  $f(x) = \frac{x^2 - 1}{x^2 - 4}$

15marks

- What is the domain of definition of  $f(x)$  ?
- State any asymptotes
- Determine the nature of the turning point
- Find the coordinates of the point at which the curve  $C_f$  cuts the coordinates axes;
- Sketch the graph of the curve in Cartesian plan.

17. Given curve  $y = x^2$  and the line  $y = x + 6$ .

(i) Determine the coordinate of point of intersection of the curve  $y = x^2$  and line  $y = x + 6$ .

5marks

(ii) Sketch the curve  $y = x^2$  and  $y = x + 6$  on the same axes.

5marks

(iii) Determine the area enclosed between the curve  $y = x^2$  and  $y = x + 6$ .

5marks