MATHEMATICS HOLIDAYPACKAGE FIRST TERM (100 marks)

CLASSES: S4 MCB,MPC,MEG,MCE,PCM

1. What do you understand from?

a) logic, b) trigonometry, c) binary operation, d) absolute value of a number? **(6 marks)**

2. Determine which of the pairs of the following are logically equivalent

$i.(P \leftrightarrow q) and\ (p \rightarrow q) \cap (q \rightarrow p)$ **(4marks)**

$ii.\ p \cup (q \cap r) and\ (p \cup q) \cap (p \cup r)$ **(4marks)**

3. i) By the table establish two Morgan's laws **(6marks)**
ii) Precise whether the proposition is a tautology or contradiction

$[(-p) \wedge (q \wedge r)] \wedge (-q)$ **(4marks)**

4. Given the propositional function $p(x): x + 3 > -2$. Determine the values and the truth value for the following $a) p(8)\ \ b) p(2)\ \ c)\ p(8) \wedge [\sim p(2)]$ **(5marks)**

b) Prove that conjunction distributes over disjunction **(4marks)**

5. Demonstrate the following trigonometric identities

a) $\frac{1+\sin x}{1-\sin x} + \frac{\sin x - 1}{1+\sin x} = 4\sec x \tan x$ b) $\frac{1+\cos^2 x}{\sin^2 x} = 2\csc^2 x - 1$ **(7marks)**

c. Prove the trigonometric identity**:** $\sqrt{(3\cos y + 4\sin y)^2 + (4\cos y - 3\sin y)^2} = 5$

6. a) Convert $81^0 13' 08''$ to decimal degree **(3marks)**

b) Convert 117.6572 to degree minutes second system **(3marks)**

c) Given that $\sin x = \frac{1}{6}$ *and* $\frac{\pi}{2} < x < \pi$ **.** Find cos x and the other trigonometric ratios **(6 marks)**

7. Solve and write down the set of solutions

i) $4(5x + 10) = 6|2x - 3|$ ii) $|2(5 - x)| \geq 19$ **(4 marks)**

8. Two cars leave the same station simultaneously, moving along straight trucks that form an angle of 30 degrees. If one car travels at an average speed of 50 km/h and the other at an average of 60 km/h., how far apart are the two cars after two hours? **(4marks)**

9. Given two binary operations defined by $\forall x, y \in \Re$
$x \Delta y = x + b - 4$ and $x \mathrm{T} y = 5xy$

i) Find the identity element of each of the composition law. **(3marks)**

ii) Verify if the law Δ is commutative and associative **(3marks)**

iii) Demonstrate that T is distributive according to Δ or not. **(3marks)**

10. Two vertical lamp posts of equal height stand on the side of the road way which is 50 m wide .At the point in the road way between the lamp post are $60^0\ and\ 30^0$. Find the height of each lamp post and the position at the point. **(5marks)**

11. Copy and complete the following table. **(6 marks)**

Angles	Sine	cosine	Tangent	cotangent	Secant	Cosecant
30 degrees	.	.	.	.	.	.
$\frac{7\pi}{4}rd$						

12. a). In the set of real number we define the binary operations$*$ $and\Delta$ by $x * y = \frac{x-3xy+5}{2}$ and

$x\Delta y = x^2 + xy + y - 8$. Calculate i) $3 * (1\Delta 0)$ ii) $(3 * 1)\Delta(3 * 0)$ **(5 marks)**

b) Write down the Cayley table for addition modulo 6 on the set Z_6 and verify if it is a commutative group or Abelian group. **(5 marks)**

13.A Town B is 13km south and 18km West of town A . Find the bearing and distance of B from A (**3marks)**

14.

. Let $*$ be a binary operation defined on the ring of integers Z by $a*b = a+b-1$

a) Calculate $(-10)*(-2)$ **(1 Marks)**

b) Is the binary operation Associative? Commutative? **(3 Marks)**

c) Determine whether there is an identity element? **(2 Marks)**

d) Determine whether there is inverse (opposite) **(2 Marks)**

e) Conclude on $(Z,*)$ **(1 Marks)**

END