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Mathematics Mid Exam for Natural Science *August 09, 2021*

JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCES

DEPARTMENT OF MATHEMATICS

Mark=30%

time allowed=2:30 hrs

Name: ______________________ **ID No:** ____________ **Section:** ________

PART I: Multiple Choice Items: Choose the best answer from the given alternatives (7pts)

1. If $n(U)=50$, $n(A)=26$, $n(A\cap B)=12$, $n(A'\cap B')=10$, then $n(B-A)=$ ___

   A) 14 B) 26 C) 12 D) 22

2. Let $A=\left\{\frac{2}{3^n}+\frac{(-1)^n}{2^{n-1}} \mid n\in N\right\}$. What is the least upper bound of A?

   A) $\frac{17}{36}$ B) $\frac{-1}{3}$ C) $\frac{13}{18}$ D) 0 E) $\frac{7}{6}$

3. Suppose $p\Rightarrow(r\vee\neg q)$ is false, then which one of the following is **true**?

   A) $p\Rightarrow r$ B) $q\Leftrightarrow r$ C) $\neg p\vee r$ D) $r\Rightarrow q$

4. Let $U=\{1,2,3\}$ be the universal set. Which one of the following is **not true**?

   A) $(\exists x)(\forall y)(x^2+2y<10)$ C) $(\exists x)(\exists y)(x^2+y^2<2xy)$

   B) $(\exists x)(\exists y)(x^2+2y<10)$ D) $(\forall x)(\exists y)(x^2+2y<10)$

5. Let $U=\{3,5,11\}$ be the universal set. Which one of the following is **true**?

   A) $\neg(\exists x)(\exists y)(xy-2 \text{ is composite})$ C) $(\forall x)(\exists y)(\frac{x}{y}<1)$

   B) $\neg(\forall x)(\forall y)(xy-2 \text{ is prime})$ D) $(\exists x)(\forall y)(\frac{x}{y}>1)$

6. What are the solution set of $z^2+(2i-3)z+5-i=0$?

   A) $\{1+i,-2+3i\}$ B) $\{1+i,2+3i\}$ C) $\{-1+i,2-3i\}$ D) $\{1+i,2-3i\}$

7. Let $A=\{\phi,\{\{\ \}\}\}$. Which one of the following is **not true**?

   A) $\phi\subseteq A$ B) $\{\{\{\ \}\}\}\subseteq P(A)$ C) $\phi\in A$ D) $\phi\in P(A)$ E) $\phi\subseteq P(A)$

PART II: Short Answer Items: Write the most simplified answer on the space provided ([illegible]pts)

8. Let $z = \left(\dfrac{1-\sqrt{3}i}{\sqrt{2}+\sqrt{-6}}\right)^{28}$

(a) $Re(z) =$ ______ (b) $Im(z) =$ ______ (c) $Arg(z) =$ ______ (d) $|z| =$ ______

9. Suppose $GCF(x,120,300) = 12$ & $LCM(x,120,300) = 1200$, $x =$ ______

10. If $A \cup C = \{x \mid x \in \mathbb{R},\ x^3 - x^2 - x + 1 = 0\}$ & $A \cup C = \{x \mid x \in \mathbb{R},\ |2x-3| < 5\}$, the

$(A \cap B) \cup C =$ ______

11. Suppose $A = \left\{x \mid x \in \mathbb{R},\ \sqrt{2x^2-1} \neq x \Rightarrow \sqrt{x+3} = 3 - x\right\}$.

$P(A) =$ ______

PART III: Workout Items: Show all the necessary steps clearly and neatly! **(16pts)**

12. Prove whether the following argument is valid or invalid by using formal proof (Without truth table). $q \Rightarrow r, \neg s \Rightarrow (w \Rightarrow p), s \vee (q \vee w), \neg s \vdash \neg r \wedge \neg p$

13. Using logical equivalence (Without truth table), Prove that

$$[(\neg p \Rightarrow q) \wedge ((p \Rightarrow \neg r) \wedge r)] \Rightarrow q \text{ is tautology.}$$

14. Prove that $10^n + 3x4^{n+2} + 5$, $n \geq 0$ is divisible by 9 by using Mathematical induction.

15. Find all roots of: $z^6 + 3iz^3 + 10 = 0$

ATC NEWS

Bahir Dar University
College of Science
Mathematics for Natural Sciences(Math 1011)

Mid Exam (30%). Form: A

Name:
ID:
Dept:
Section:
Date:

Part I. Multiple Choice Questions (6%)

Instruction: Encircle the correct answer from the given alternatives.(1 pt each.)

1. If $GCF(x, 286) = 22$ and $LCM(x, 286) = 6006$. then what is the value of x?
   (a) 128
   (b) 230
   (c) 471
   (d) 462
   (e) None

2. Which of the following is True?
   (a) The sum of rational number and irrational number is irrational.
   (b) The product of two irrational numbers is rational number.
   (c) The product of two irrational numbers is irrational.
   (d) The sum of two irrational numbers is irrational
   (e) None

3. Let A be any set. Which one of the following is **Not True**?
   (a) $A \subseteq A$
   (b) $A \in \mathcal{P}(A)$
   (c) $\emptyset \in \mathcal{P}(A)$
   (d) $A \subseteq \mathcal{P}(A)$
   (e) None.

4. Which of the following is a **proposition**?
   (a) x is divisible by 2.
   (b) Thank you!
   (c) For any real number x, $x^2 \geq 0$.
   (d) $x + 1 = 5$
   (e) None.

5. Which of the following is **Not True**?
   (a) $(\forall x \in \mathbb{N})(\exists y \in \mathbb{Z})(x \leq y)$
   (b) $(\exists x \in \mathbb{N})(\forall y \in \mathbb{Z})(x \leq y)$
   (c) $(\exists x \in \mathbb{Z})(\forall y \in \mathbb{R})(x \leq y^2)$
   (d) $(\forall y \in \mathbb{R})(\exists x \in \mathbb{Z})(x \leq y^2)$
   (e) None.

6. Let z_1 and z_2 be complex numbers. Which of the following is **True**?

(a) $\overline{z_1 z_2} = \overline{z_1}\,\overline{z_2}$

(b) $|z_1 + z_2| \leq |z_1| + |\overline{z_2}|$

(c) $|z_1 - z_2| \leq |z_1| - |z_2|$

(d) $|z_1|^2 = \overline{z_1 z_1}$

(e) None.

Part II. Short Answer Questions (12%)

Instruction: Write the most simplified answer on the space provided. (1.5 pts each)

7. Let $U = \{1, 2, 3, 4, 5, 6, 7\}$ be the universal set and let $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 3, 6, 7\}$. Th
$A \triangle (A - B) =$ _____.

8. Given set $A = \left\{ \frac{4+3n}{1+n} \right\}$ for $n \in \mathbb{N}$.

(a) lub of $A =$ ____

(b) glb of $A =$ ____

9. The fraction form of $0.3\overline{13}$ is _____

10. Suppose the truth values of p, q and r are T, F and T respectively. Then, the truth value of $(\neg p \vee q) \Rightarrow [q \Leftrightarrow (p \wedge r)]$ is ____.

11. Let $z = -\sqrt{3} - i$. Then

(a) $\text{Arg}(z) =$ _____

(b) $z^{60} =$ _____ (in rectangular form)

12. Let p : Abebe attends class regularly and q : Abebe pass the exam. Write the symbolic form sentence "**Abebe attends class regularly but he fail the exam.**". _____

art III. Workout Problems (12%)

ow all the necessary steps clearly on the space provided.

. *Using Principle of Mathematical Induction*, show that $n^3 - n$ is divisible by 3. for $n \geq 2$.

Injibara University

College of Natural and Computational sciences

Department of Mathematics

Mathematics for social science Mid -Exam (30%)

Time allowed: 75'

*Name:*_____ *ID No:*_____ *Section:*_____

PartI: Write True if the statement is correct and False if the statement is incorrect.[1 po each]

1) Empty set is a propersubset of itself. F
2) $(\forall x \in \mathbb{N})[x^2 + 1 \geq 2]$. T
3) $(\forall x \in \mathbb{R})(\exists y \in \mathbb{R})[x + y = 4]$. T
4) $\neg[(\forall x)[(x > 3) \Rightarrow (x^2 > 9)]] \equiv (\exists x)[(x > 3) \wedge (x^2 \leq 9)]$. T
5) The solution set of $x^2 + 5x + 6 = 0$ is $\{2,3\}$. F

Part II: *Choose* the correct answer from the given alternatives. [1.5 points each]

6) Which one of the following sentence is proposition?
   A) Human beings are mortal C) What is your name?
   B) Read this book carefully D) May God bless you!
7) If setA has 32 subsets, then set A has _____ elements.
   A) 10 B) 32 C) 5 D) 16
8) Which of the following statement is **False**?
   A) For two sets, A &B , if $A \subseteq B$, *then* $A \cap B = A$
   B) For two sets, A &B , if $A \subseteq B$, *then* $A \cup B = A$.
   C) For any set A, $A \subset A$.
   D) $\{2,3\} \subseteq A \cap B$ *implies that* $\{2,3\} \subseteq A$ *and* $\{2,3\} \subseteq B$
9) The set $A = \{x : x$ *is natural number and* $x \leq 5\}$ is equal to:_____
   A) $\{\ldots, -2, -1, 0, 1, 2, 3, 4\}$ B) $\{1,2,3,4,5\}$ C) $\{-2, -1, 0, 1, 2, 3, 4\}$ D) $\{0,1,2,3,4\}$
10) The solution set of $3x - (8 - 3x) = 5 - (3 - x)$ is:_____
   A) $\{4\}$ B) $\{2\}$ C) $\{9\}$ D) $\{12\}$
11) What is the solution set of $\frac{2x-7}{3} \geq \frac{x+3}{4}$ if $x \in \mathbb{N}$?_____
   A) $\{1,2,3,4,5,6\}$ B) $\{\ldots, 3,4,5,6\}$ C) $\{-3, -4, -2, -1, 0, 1, 2\}$ D) $\{7,8,9, \ldots\}$

Exam date 06/04/12 E.C

PartIII: Short answer: Write the simplified answer in the space provided. [1point each]

12) Let p, q & r *have truth values* T, F, T *respectively*. Then the truth value of $(p \vee q) \Leftrightarrow \neg(p \wedge \neg r)$ is _____

13) Let $A = \{x: x \in \mathbb{Z} \text{ and } -4 < x \leq 3\}$ and $B = \{x: x \in \mathbb{N} \text{ and } x \leq 6\}$. Then

a) $A \cap B = \{$ _____ $\}$

b) $A - B = \{$ _____ $\}$

c) $A \Delta B = \{$ _____ $\}$

14) Write the converse, inverse and contrapositive of the conditional statement:

"If two angles are congruent , then they have the same measure"

Converse: _____

Inverse: _____

Contrapositive: _____

Part IV: Workout problems: Show all the necessary steps

15) For statements p, q & r, construct the truth table and show that

$$[(p \Rightarrow q) \wedge (q \Rightarrow r)] \Rightarrow (p \Rightarrow r) [3 \text{ points}]$$

Exam date 06/04/12 E.C

16) A truck carries a load of 50 boxes; some are 20 kg boxes and the rest are 25 kg boxes. If the total weight of all boxes is 1175 kg, how many of each type are there?[3 points]

$x + y = 50$

$20x + 25y = 1175$

$x = 50 - y$

$20(50 - y) + 25y = 1175$

$1000 - 20y + 25y - 1175$

$5y = 175$

$y = 35$

$x = 50 - y$

$x = 50 - 35$

$x = 15$

$20x + 25(50 - x) = 1175$

$20x + 1250 - 25x = 1175$

$-5x + 1250 = 1175$

$-5x = 1175 - 1250$

$-5x = -75$

$x = 15$

17) Solve the quadratic inequality $x^2 + 2x - 24 \leq 0$[3 points]

$x \geq 0$

$(x + 6)$

$(x - 4)(x + 6)$

$(-6 \leq x \leq 4)$

$(-\infty, -6) \cup (4, \infty)$