KINGSLEY Dynamic Su

2013/2014

ABIA STATE UNIVERSITY, UTURU

DEPARTMENT OF MATHEMATICS

MA 101 – GENERAL MATHEMATICS I

ANSWER 4 QUESTIONS ONLY 2 ½ HOURS

1(a) Let $A = \{1,2,a,b,c,d\}$, $B = \{2,3,a,c,d,e,f\}$, $C = \{2,4,c,d,h\}$, $D = \{1,9,2,b,3,c\}$, $E = \{1,a,b\}$. Describe the following sets by listing the members. (i) $A \cap C$ (ii) $A \times C$ (iii) (A/B). Describe the power sets $\rho(E)$ and $\rho(A \cap C)$.

(b) Illustrate by means of a Venn diagram the following sets (i) $X \cap Y'$ (ii) $X \cap (Y \cup Z)$ and (iii) $(X \cap Y) \cup (X \cap Z)$.

(c) If $n(A \cap B \cap C) = 18$, $n(B \cap C) = 30$, $n(A \cap C) = 48$, $n(A \cap B) = 42$; $n(C) = 126$, $n(B) = 96$ and $n(A) = 120$. What is $n(A \cup B \cup C)$?

2(a) Prove that the sum of squares of the first n odd integer is $\frac{1}{3}n(2n-1)(2n+1)$.

(b) The variable n represents a positive integer. Use mathematical induction to prove the statement. (i) $2 + 6 + 12 + \cdots + n(n+1) = \frac{n(n+1)(n+2)}{3}$.

(c) A given A P consists of 3m terms. The sum of the first m terms, the next m terms and the last m terms are x, y and z respectively. Prove that $(x-z)^2 = 4(y^2 - xz)$ (ii) Find $n (n > 0)$ if the sum of the following arithmetic progressions are equal:

1,5,9,13, … $nth\ term$,

19,17,15,13, …, $nth\ term$.

Undone – 2, 3(i), 3b, 1(i), 4(ii), 4b, 5b, 6.

3(a) (i) State the principle of mathematical induction. (ii) Prove by induction that $1 + 3 + 5 + \cdots + (2n-1) = n^2$ for all positive integers n.

(b) If α and β are roots of $x^2 - 4x + 1 = 0$, find (i) $\alpha + \beta$, (ii) $\alpha\beta$ (iii) $\alpha^4 + \beta^4$.

(c) Find the partial fraction expansion of (i) $\frac{8x+9}{(x+1)(x+2)}$ (ii) $\frac{x^2-2x+4}{x(x-1)^2}$

4(a) Use the Binomial theorem to expand the expression. (i) $(a + b)$ (ii) without using calculators or tables. Find $\sqrt{50}$ correct to at least four decimal places.

(b) Find the solution of the equation (i) $2\sin^2\theta + 3\cos\theta = 0$.

(c) From the first principle show that $\cos^2\theta + \sin^2\theta = 1$.

Done

5 (a) Express the number $\frac{5+i}{2+3i}$ in the standard form and find its modules and its principal Argument. (b) Prove that (i) $\cos^2\theta + 4\sin^2\theta = 4\cos\theta\sin\theta$ (ii) $\frac{1}{1+\cos x} + \frac{1}{1-\cos x} = 2\operatorname{cosec}^2 x$ Done

6 (a) Given $z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$ and $z_2 = r_2(\cos\theta_2 + i\sin\theta_2)$. Show that

(i) $\arg(z_1 z_2) = \arg z_1 + \arg z_2$ (ii) $\arg\left(\frac{z_1}{z_2}\right) = \arg z_1 - \arg z_2$.

(b) Find the argument and principal argument of $z = -1 - i$. Represent in an arg diagram.

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ABIA STATE UNIVERSITY, UTURU

2016/2017 1ST SEMESTER EXAMINATIONS

DEPARTMENT OF MATHEMATICS

GENERAL MATHEMATICS I: MAT 101 (3 UNITS) TIME ALLOWED: 3HRS

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS FROM THE SIX (6) GIVEN AND CLEARLY SHOW ALL WORKINGS. DO NOT WRITE ON YOUR QUESTION PAPER.

Set theory (Venn diagram)

1 In a class of 60 students, 24 offered Mathematics, 16 offered Chemistry while 23 offered Physics. 7 students offered Mathematics and Chemistry, 11 students offered Mathematics and Physics, 5 students offered Chemistry and Physics while 3 students offered the three subject combinations. WITH THE HELP OF A VENN DIAGRAM, find:

(a) the number of students that offered Physics but offered NEITHER Mathematics NOR Chemistry.

(b) the number of students who DID NOT OFFER ANY OF THE THREE subject combinations.

(Sequences and series)

2(a) Let S_n denote the sum of the first n terms of the Arithmetic Progression. Show that $S_n = \frac{n}{2}(2a + (n-1)d)$.

(b) The third term of a Geometric Progression is 36 and the sixth term is $\frac{243}{2}$. Find the first term and the common ratio.

(polynomials)

225° to π

3(a) Let $P(x) = 3x^3 + 5x^2 - 10x + 2$.
Is $(x-1)$ a factor of $P(x)$? Justify your answer.

(b) If α and β are the roots of $2x^2 - 10x + 8 = 0$. Find $\alpha^2 + \beta^2$.

(c) Express $\frac{x+7}{x^2-7x+10}$ in partial fractions. Partial fractions

(Permutation & combinations)

4(a) A West African basketball team (5 players) is to be formed from 7 Nigerians and 6 Ghanaians, with the understanding that it must include 3 Nigerians. In how many ways can such a team be selected?

(b) Expand $(2+x)^6$ in ascending powers of x.

$\pi = 180°$ ${}^7C_3 \times {}^6C_2$

$? = 225$

$225\pi = 180$

$\pi = \frac{180}{225}$

Trigonometric function & Identities

5(a) (i) Convert 225° to π radians.

(ii) Without using tables, find the tangent of the acute angle whose sine is 0.8.

(b) Show that $\sin^2\theta + \cos^2\theta = 1$. *(Hint: Use a right-angled triangle)*

6(a) Express each of the following complex numbers in the standard form:

(i) $(2+3i) + (5-2i)$ (ii) $(3-4i) - (2-2i)$

(iii) $(3+i)^2$ (iv) $\frac{3-2i}{1+i}$

2 Pm

(b) Find the conjugate of the complex number $\frac{2-i}{(3+i)^2}$.

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Good Luck!

(b) Expand $\left(x+\frac{1}{x}\right)^5$ and simplify each term.

4(a) Divide $P(x) = x^4 - 3x^3 - 17x^2 + 34x + 5$ by $S(x) = x - 5$

(b) Prove that the sum of the first n terms of the geometric progression is given as

$$S_n = \frac{a(1-r^n)}{1-r} \quad if\ r < 1$$

5(a) If α, β are the roots of $x^2 - 12x + 7 = 0$ find the values of:

(i) $\alpha^2 + \beta^2$ (ii) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (iii) $\frac{1}{\beta} + \frac{1}{\alpha}$

(b) Insert three arithmetic means between 11 and 31

(6)(a) If $\tan\alpha = \frac{1}{2}$ and $\tan\beta = \frac{1}{3}$ find $\tan(\alpha+\beta)$

(b) Express in $x + yi$ form of the following complex number

(i) $(7+2i) + (3-2i)$ (ii) $(4-3i) - (3-7i)$

(iii) Express $\frac{4+i}{3-i}$ in the form $a + bi$ where $a, b \in \mathbb{R}$

ABIA STATE UNIVERSITY UTURU
DEPARTMENT OF MATHEMATICS
2019/2020 FIRST SEMESTER EXAMINATION
GENERAL MATHEMATICS 1 (MAT 101)

INSTRUCTIONS: (i) **WRITE YOUR FULL NAME ON THE ANSWER BOOKLET**

(ii) **ANSWER FOUR QUESTIONS ONLY** TIME: **2hrs**

1. Out of ~~174~~ students in faculty of Physical sciences ABSU, it was found that **37** studied Mathematics (M), **60** Physics (P) and **111** studied Biology (B). **29** studied Mathematics and Biology, **50** Physics and Biology, **13** Physics and Mathematics. If **45** physical sciences students did not study either Mathematics or Physics or Biology. **(a)** How many studied all the three courses? **(b)** How many studied Physics and Biology but no Mathematics? **(c)** Let Set $A = \{1, 2, 3\}$, generate the Power Set of A:

2. **(a)** In how many ways can **4** security men be posted round a boxing ring during a fight?
   (b) Find the **9th** term of the sequence **6, 11, 16, 21, 26, ...**

3. **(a)** Prove that the sum of a GP is $S_n = \frac{a(1-r^n)}{1-r}$, Hence show that $S_4 = (1+r^2)S_2$
   (b) What is the sum of the **10th** term of the GP **4, 8, 16, ...**

4. **(a)** Prove by Mathematical Induction that $1 + 3 + 5 + \cdots + (2n-1) = n^2$
   (b) Find the Partial fraction expansion of $\frac{5x-4}{x^2-x-2}$

5. **(a)** Prove the following identities
   (i) $\sin^2\theta + \cos^2\theta = 1$ (ii) $\tan^2\theta + 1 = \sec^2\theta$
   (b) Without tables nor calculator evaluate $\tan 315^\circ$ (show all workings)

6. Perform the operations and express your answers in standard form
   (i) $(4+3i) + (3+2i)$ (ii) $(2-i) - (4-5i)$ (iii) $\frac{3+i}{1-2i}$
   (iv) $\frac{1}{(3-2i)^2}$

NB: ENSURE THAT YOU HAVE REGISTERED THIS COURSE. WEAR FACE MASK!!!!

ABIA STATE UNIVERSITY, UTURU
2016/2017 1ST SEMESTER EXAMINATIONS
DEPARTMENT OF MATHEMATICS

GENERAL MATHEMATICS I: MAT 101 (3 UNITS) TIME ALLOWED: 3HRS

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS FROM THE SIX (6) GIVEN AND CLEARLY SHOW ALL WORKINGS. DO NOT WRITE ON YOUR QUESTION PAPER.

1. In a class of **60 students, 24** offered **Mathematics, 16** offered **Chemistry** while **23** offered **Physics. 7 students** offered **Mathematics and Chemistry, 11 students** offered **Mathematics and Physics, 5 students** offered **Chemistry and Physics** while **3 students** offered **the three subject combinations. WITH THE HELP OF A VENN DIAGRAM,** find:
   (a) the number of students that offered Physics **but** offered **NEITHER** Mathematics **NOR** Chemistry.
   (b) the number of students who **DID NOT OFFER ANY OF THE THREE** subject combinations.

2(a) Let S_n denote the sum of the first n terms of the **Arithmetic Progression.** Show that $S_n = \frac{n}{2}(2a + (n-1)d)$.

(b) The **third term** of a **Geometric Progression** is **36** and the **sixth term** is $\frac{243}{2}$. Find the **first term** and the **common ratio.**

3(a) Let $P(x) = 3x^3 + 5x^2 - 10x + 2$.
Is $(x-1)$ a factor of $P(x)$? Justify your answer.

(b) If α and β are the roots of $2x^2 - 10x + 8 = 0$. Find $\alpha^2 + \beta^2$.

(c) Express $\frac{x+7}{x^2-7x+10}$ in partial fractions.

4(a) A West African basketball team (**5 players**) is to be formed from **7 Nigerians** and **6 Ghanaians,** with the understanding that **it must include 3 Nigerians.** In how many ways can such a team be selected?

(b) Expand $(2+x)^6$ in ascending powers of x.

5(a) (i) Convert $225°$ **to π radians.**
(ii) Without using tables, find **the tangent of** the **acute angle** whose **sine** is **0.8.**

(b) Show that $sin^2\theta + cos^2\theta = 1$. ***(Hint: Use a right-angled triangle)***

6(a) Express each of the following complex numbers in the standard form:
(i) $(2+3i)+(5-2i)$ (ii) $(3-4i)-(2-2i)$
(iii) $(3+i)^2$ (iv) $\frac{3-2i}{1+i}$.

(b) Find the **conjugate** of the complex number $\frac{2-i}{(3+i)^2}$

Good Luck!

ABIA STATE UNIVERSITY, UTURU
2015/2016 1ST SEMESTER EXAMINATIONS
DEPARTMENT OF MATHEMATICS
MAT 101: GENERAL MATHEMATICS I **TIME: 3HRS**
INSTRUCTION: ANSWER ANY FOUR (4) QUESTIONS

1(a) Compute $\mathcal{P}(M)$, if $M = \{\sqrt{5}, -3, 15, \frac{1}{2}\}$. What is the cardinality of $\mathcal{P}(M)$?

(b) In a class of 50 students, 18 offered Mathematics, 21 offered Chemistry while 16 offered Biology. 7 students offered Mathematics and Chemistry, 8 students offered Mathematics and Biology, 9 students offered Chemistry and Biology while 5 students offered the three subject combinations. **With the help of a Venn diagram,** find:

(i) the number of students that offered Mathematics but offered neither Chemistry nor Biology.

(ii) the number of students who did **not** offer any of the three subject combinations.

(c) Prove by induction that $1 + 3 + 5 + \cdots + (2n-1) = n^2$.

2(a) Find the sum of each of the following geometric progressions:

(i) $10, 5, 2^1/_2, \ldots, to\ 10th\ term$

(ii) $6^3/_4, -4^1/_2, 3, \ldots, to\ 20th\ term$.

(b) Show that the summation of **arithmetic** and **geometric** series are given by

$$S_n = \frac{n}{2}[2a + (n-1)d] \qquad \textbf{and}$$

$$S_n = \frac{a(1-r^n)}{1-r},\ if\ r < 1 \quad or \quad S_n = \frac{a(r^n-1)}{r-1},\ if\ r > 1;$$ **respectively.**

3(a) Divide the polynomial $f(x) = 3x^4 + 2x^3 + 4x$ by $(x+5)$ and state if $x = -5$ is a zero of this polynomial.

(b) Solve each of the following equation

(i) $\frac{1}{x+1} = 1 + \frac{5}{x-4}$.

(c) Determine the partial fraction decomposition of $\frac{3x^3+7x-4}{(x^2+2)^2}$.

4(a) In how many ways can the president form a cabinet of 8 men and 4 women from a list of 10 male candidates and 7 female candidates?

(b) Show whether the following relation holds or not: ${}^nP_r = r!\binom{n}{r}$.

(c) Find the 4th term of $(2x - 5y)^7$ and express the value at $x = 1,\ y = 2$.

5(a) Convert **accordingly** from **radians** to degrees or from degrees to $\boldsymbol{\pi}$ **radians.**

(i) $1\ rad.$ (ii) $\frac{7\pi}{4} rad.$ (iii) $30°$ (iv) $315°$

(b) (i) Without using tables, find the **tangent** of the acute angle whose **sine** is 0.8.

(ii) Evaluate $\boldsymbol{Arcsin}$ 0.5.

(c) Verify that $\frac{tanA - cotBsecA}{tanB - cosecA} = tanAcotB$.

6(a) Express each of the following complex numbers in the standard form:

(i) $(\sqrt{3} + i) - (2\sqrt{3} + 3i)$ (ii) $(1-2i)^2$ (iii) $\frac{3+2i}{4-i}$ (iv) $|1-i|^2$.

(b) Find the conjugate of the complex number $\frac{2-i}{(1-2i)^2}$.

(c) Find the modulus, arguments, and principal argument of each of the following:

(i) i (ii) $-\sqrt{5}$.

$\frac{9(1-0.5^{10})}{0.5-1}$

$\frac{10\times 0.5}{0.5-1}$

$2(k+1-1)$

$2k+2-1$

ABIA STATE UNIVERSITY UTURU

TIME: 2 hrs

DEPARTMENT OF MATHEMATICS

MAT 101 - GENERAL MATHEMATICS I

2020/2021 FIRST SEMESTER EXAMINATION

INSTRUCTIONS: (i) Write your full Name and Matric Number

(ii) Answer any FOUR (4) questions

1. Let $U = \{-10, -9, ..., 10\}$ be the set of integers with each of X, Y, Z a subset U and $X = \{x: -4 < x < 4\}$, $Y = \{y: -6 < y \leq 6\}$, $Z = \{z: -3 \leq z < 3\}$
(a) List the elements of X, Y and Z and find (i) $X \cap Y$ (ii) Z' (iii) $X \cap (Y \cup Z')$
(b) In a group of 240 students, 14 plays football; 130 play table tennis and 106 play hockey. If 70 of the students plays football and tennis, 60 play football and hockey, 42 play both tennis and hockey and each of the students play at least of one of the three games. Illustrate the above information in a Venn diagram.
How many played: (i) all three games? (ii) exactly two of the three games? (iii) exactly one of the three games? (iv) football only?

2(a) Prove by mathematical induction that

$$3 + 7 + 11 + 15 + \cdots + (4n - 1) = n(2n + 1)$$

(b) Find the number of ways in which 13 students can be divided into (i) two groups consisting of 6 and 4 students.

3(a) Express $\frac{2x+3}{(x+1)(2x+1)(x-3)}$ in partial fractions.

(b) Expand $\left(x + \frac{1}{x}\right)^5$ and simplify each term.

4(a) Divide $P(x) = x^4 - 3x^3 - 17x^2 + 34x + 5$ by $S(x) = x - 5$

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(b) Insert three arithmetic means between 11 and 31

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