(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER

MAIN EXAMINATION

FOR THE DIPLOMA IN EDUCATION

MATHEMATICS

COURSE CODE: **EDM 101**

COURSE TITLE: **NUMBER SYSTEMS**

DATE: 18/01/18 **TIME:** 9 AM - 11 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE 28 MARKS (COMPULSORY)

a. Define the following terms as used in Number Systems

i. Inductive reasoning

ii. Deductive reasoning

iii. Set (3mks)

b. Given three sets A, B and C, use Venn diagrams to show the region (A n B)u C (2mks)

c. Use a truth table to represent the following proposition

(p $\longrightarrow$ q) $\longrightarrow$ (P ^ q) (3mks)

d. The following table shows some symbols used in ancient Greek system and their respective Hindu- Arabic quantities. Use them to answer questions

Greek symbol	Υ	β	i	μ	λ	ϕ	ν
Hindu – Arabic	3	2	10	40	30	500	400

I. Write Y^{i} ϕ μ β in Hindu- Arabic (2mks)

II. Write 432 in Greek system (2mks)

e. Given that p represents Tom is tall and q represents Tom is rich, write each of the following statements in symbolic form.

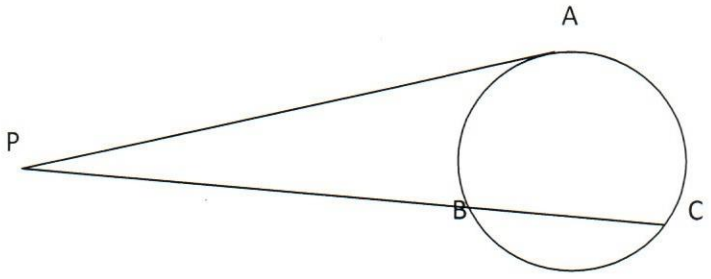
i. Tom is short and poor (2mks)

ii. It is not true that Tom is tall or not rich (2mks)

f. Make R the subject of the formula below

S= $2\pi R + \pi R\ H$ (3mks)

g. In the diagram below PA is the tangent to a circle centre O at A and PBC is a secant with points B and C on the circle. If PA= 8cm, BC= 4cm, find length PC (3mks)



n. i. Find the first 5 terms of the sequence (2mks)

$a_n = ½ + n/3$

ii. Find the sum of the first 20 terms of the series (2 mks)

i) Given two statements P and Q, distinguish between conditional and bi-conditional (2mks)
logical connectives

QUESTION TWO (16 MARKS)

a. Show that the proposition $p \rightarrow q$ and $\sim p \vee q$ are logically equivalent (4mks)

b. Given that μ=(a,b,c,d,e,f,g) is a universal set and A=(b,c,e) B=(a,f,g) and C=(a,b,c) are subsets of μ . List the elements in each of the following.

i. B U C' (2mk)

ii. A' U B' (2mk)

iii. (A' n C) U B (2mks)

iv. Use Venn diagram to show region A' for b. above (2mks)

c. Given that a-is the first term of a geometric sequence, r- the common ratio and n- the number of terms in the sequence, show that n^{th} term is given by ar^{n-1} (4mks)

QUESTION THREE (16 MARKS)

a. A laboratory research starts a culture with 1000 bacteria and observes that the number doubles every hour.

i. Deduce a formula for the number of bacteria present after n- hours. (3mks)

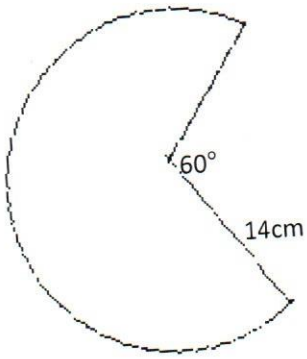
ii. How many bacteria will be present after 5 hours? (2mks)

b. Construct a truth table for the proposition (5mks)

$(P \wedge q) \wedge r$

c. Show whether that integers (1,2,3,4) under addition is a group (2mks)

d. A cone is made from a circular sector of radius 14cm below. Find the volume of the cone (4mks)



QUESTION FOUR (16 MARKS)

a. Show that $(A \cup B)^c = A^c \cap B^c$ (3mks)

b. Given that μ is a universal set of integers from one to 10. A, B are subsets of μ where A =(2,4,6) and B=(3,5,7,9) .Find all the min terms of A and B. (5mks)

c. Evaluate (4mks)

$$\frac{5/6 \text{ of } (4\ 1/3 - 3\ 5/6)}{5/12 \times 3/25 + 1\ 5/9 \div 2\ 1/3}$$

d. Solve the inequality and represent your answer in a number line (4mks)

$6x - 2(x + 3) \leq 7(x + 1) - 4$

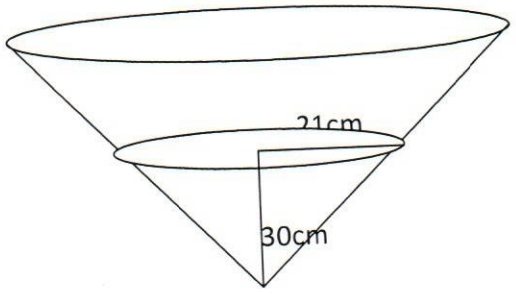
QUESTION FIVE (16 MARKS)

A triangle with vertices A (-4,2) , B (-6,6) and C (-6,2) is enlarged by a scale factor -1 at centre (-2,6) to produce triangle A' B' C'. Triangle A' B' C' is then reflected in the line y=x to give triangle A" B" C".

a. Draw triangle ABC, A' B' C' and A" B" C" and state the co-ordinates of A" B" C" (7mks)

b. If triangle A" B" C" is mapped onto A"' B"' C"' whose co-ordinates are A"' (0, -2) B"' (4, -4) and C"' (0, -4) by a rotation. Find the centre and the angle of rotation. (5mks)

c. Consider the vessel below filled with water to a depth of 30cm



Calculate the volume of the water in the vessel (4mks)