KAMONYI DISTRICT

HOLYDAYS WORK, 2024-2025

SUBJECT: MATHEMATICS II

-MATH-ECONOMICS-GEOGRAPHY (MEG)

-MATHEMATICS –COMPUTER-ECONOMY (MCE)

INSTRUCTIONS:

This paper has THREE sections A and B

SECTION A: Attempt ALL questions (55 marks)

SECTION B: Attempt any THREE questions (45 marks)

SECTION A: Attempt all the questions (55 marks)

1) Given the complex number $z = 45i$ $w = 7i - 10$

a) Complete the folowing table **/2marks(0.5mark each)**

Complex number	Real part	Imaginary part
Z		
W		

b) answer true or false/ **2marks (1mark each)**

i) z is purely imaginary

ii) w is real

2) find the value of i^{2243} **/2marks**

3) *calculate the following limits* $\lim_{x\to 0} \frac{\ln(\cos x)}{x}$ **/2marks**

4) *find the domain of definition of* $f(x) = ln\left(\frac{x+1}{x-1}\right)$ **/4marks**

5) find the monthly payment on a mortgage of 75000 frw on 8% interest rate that run for 20years **/3marks**

6) given $f(x) = ln(1 - x)$ and $g(x) = e^x$

a) write the Maclaurin polynomial of degree three of f(x) **/2marks**

b) write the Maclaurin polynomial of degree three of g(x) **/2marks**

c) use the results obtained on a)to solve $ln(1 - x) + e^x = 1$ **/2marks**

7) $evaluate \int (sin4x)e^{cos4x}dx$ **/2marks**

8) The population of a colony of rabbits in a park increases at a rate proportional to the population. Initially, there were ten rabbits in the park. When the population is 100 rabbits, the colony is increasing at a rate of seven rabbits per month.

a) Form a differential equation for the population increase and solve it.**/4marks**

b) find the number of rabbits when t=20months **/1mark**

9) Consider $F = \{(2x, 0, z): x; z \in \mathbb{R}\}$ and $G = \{(2x, 3y, 0): x; y \in \mathbb{R}\}$. . Verify Grassmann's formula of dimensions.**/4marks**

10) find $\frac{dy}{dp}$ given that y= $\ln(p + cos2p)$ **/3marks**

11) use complex number to solve $cosx + \sqrt{3}sinx = \sqrt{3}$ **/3marks**

12) for all natural n, the numerical function $H_n(x) = \frac{x^n}{1+x^2}, x\epsilon\mathbb{R}, given$

$M_n = \int_0^1 H_n(x)dx$ show that $\forall k\epsilon$, $M_{2k} + M_{2k+2} = \frac{1}{2k+1}$ **/4marks**

13) $a) linearise\ cos^2 8xsin3x$ **/4marks**

$b) deduce \int cos^2 8xsin3xd$ **/2marks**

14) $find\ the\ general\ solution\ of\ the\ following\ differential\ equation$:

$(1 + e^x)\frac{dy}{ydx} = e^x$ **/4marks**

15) Let U and W be the following subspaces of $\mathbb{R}^4$: U= $\{(a,b,c,d): b+c+d=0\}$ W=$\{(a,b,c,d): a+b=0, c=2d\}$. Find the dimension of U $\cap$W **/3marks**

<u>SECTION B: Attempt any 3 the questions (45 marks</u>)

16) solve $y'' - 2y' = x + 2e^x \quad given\, that\ \ y(0) = 0, y'(0) = 1$ **/15marks**

17) $given\ \ I = \int_0^{\frac{\pi}{4}} (2x + 1)cos^2 x dx$

And $M = \int_0^{\frac{\pi}{4}} (2x + 1)sin^2 x dx$

a) calculate $I + M$ **/2MARKS**

b) calculate $I - M$ **/8MARKS**

C)deduce the value of $I\ and\ M$ **/5MARKS**

18) using integration Find the length of the circle of radius H and centre (0,0) **/15MARKS**

19) Let f be the linear transformation from$\mathbb{R}^2$ to $\mathbb{R}^3$ defined by f ($\vec{V}$)=A $\vec{V}$ with

$$A=\begin{pmatrix} 1 & 3 \\ 2 & 6 \\ 3 & 9 \end{pmatrix}$$

a) Find a basis for Ker (f) **/6Marks**

b) Determine if f is one to one. **/1Mark**

c) Find a basis for the range of f **/6Marks**

d) Determine if f is onto **/2Marks**

20) $given\ p(z) = z^4 - 4(1 + i)z^3 + 12iz^2 - 8i(1 + i)z - 5$

a) Factorize completely p(z) **/10MARKS**

b) Solve p(z)=0 **/5MARKS**

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