EDO UNIVERSITY, IYAMHO, EDO STATE

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS/ICT

FIRST SEMESTER EXAMINATION 2016/2017 SESSION

Course Title: **CALCULUS** Course Code: **MTH 112**

Time allowed: **3 Hours** **Instruction**: Answer any five (5) questions Date: 11TH May,2017

1(a) Define the following terms (i) Domain of a function (ii) Range of a function (iii)Composite function

(b) Represent the following interval domain using a pair of brackets

(i) $|x-4|<1$ (ii) $-1<(x-3)\leq 2$ (iii) $|x|<3$

(c)) Given $f(x)=2x^2+3x-7$, evaluate . $\frac{f(a+h)-f(a)}{h}$

2(a) Several values of two functions f and g are listed in the following tables:

x	1	2	3	4
$f(x)$	3	4	6	2

x	1	2	3	4
$g(x)$	3	2	4	8

Find (i) (f∘g)(3) (ii) (g∘f)(4) (iii)(g∘g)(2)

(b) Evaluate the limits of (i). $\lim_{x\to\pi}\frac{tanx}{sin2x}$

(ii) Evaluate $\int_1^2(2x-3)^4dx$

(c)Given,

$$f(x)=\begin{cases}-x^3, & if\ x<-1\\ ax-b, & if\ -1\leq x<1\\ 5x, & if\ x\geq 1\end{cases}$$

are continuous on ℝ, determine the values of a and b

3(a) Integrate $\int \sin^4 x\,dx$ {Hint: $\sin^2 x=\frac{1}{2}(1-cos2x)$}

(b)State the steps for differentiating from the first Principle

(c)i.If $y=2x^2+3x+\frac{4}{x}$, find $\frac{dy}{dx}$ from first principle.

ii. Show that $2^n={}^nC_0+{}^nC_1+{}^nC_2+{}^nC_3+\ldots+{}^nC_n$ and state any necessary condition.

4.(a) If $y=cosx, find\ \frac{dy}{dx}$ from first principle.

(b) Find the term in x^9 and the term independent of x in the expansion of $\left(2x^2-\frac{1}{x}\right)^{12}$.

(c) (i)Given $y=\cos^{-1}x$, find $\frac{dy}{dx}$

(ii)Evaluate using L'Hopital's rule, $\lim_{x\to 2}\{\frac{x^3-2x^2-x+2}{x^2-x-2}\}$

5.(a) If $x^2 + 2xy + 3y^2 = 4$, find $\frac{dy}{dx}$

(b) If $y = \cos 2t$ and $x = sint$, Show that $\frac{dy}{dx} = -4sint.$

(c)i.Differentiate $y = X^{3x}$

ii. Find the equations of the tangent and normal at the point (3,6) to the curve $y^2 = 12x$ and find where the normal cuts the curve again.

6.(a) Find the equations of the tangents to the curve $y = x^3 - x^2 - x + 1$ at the point (2,3) and (-1,0). Find also the co-ordinates of the point at which the tangent at the point (-1,0) meets the curve again.

(b) if $y = x^5 \sin 2x \cos 4x$, show that $\frac{dy}{dx} = x^5 \sin 2x \cos 4x \{\frac{5}{x} + 2 \cot 2x - 4\, tan4x\}$

(c)Integrate the following (i) $\int \sin x . \cos x$ (ii)$\int \frac{4x^2}{x^3-7} dx.$

7.(a) If $y = 2x^5 + 4x^4 - x^3 + 3x^2 - 5x + 10$, find $\frac{d^4y}{dx^4}$

(b) Integrate the following (i) $\int 4^{5x} dx.$ (ii) $\int (2x + 7)^4 dx$

(c)Using the LIATE rule of integration by parts, show that

(i) $\int e^{3x} \sin x\, dx = \frac{e^{3x}}{10}(3 \sin x - \cos x) + C$

(ii)Show that $\int x^3 e^{2x} dx = \frac{e^{2x}}{2}\left\{x^3 - \frac{3x^2}{2} + \frac{3x}{2} - \frac{3}{4}\right\} + C$