

BABCOCK UNIVERSITY, ILISHAN – REMO, OGUN STATE
SCHOOL OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BASIC SCIENCES

SECOND SEMESTER EXAMINATION, 2017/2018 SESSION
MATH 102(GENERAL MATHEMATICS II)

TOTAL MARKS: 60

TIME ALLOWED: 2 Hours

INSTRUCTION: ATTEMPT ANY FOUR (4) QUESTIONS.

EXAMINERS: ADIO, A.K., KANU, R.U., AYINDE, S.A., BAMISHILE, O.O., AKANBI, B.T.

✓ **Question 1**

- a) If $f(x) = \log_2 x$. Evaluate $f\left(\frac{1}{8}\right)$ and $f(2)$; hence, state for what value of x is $f(x) = -5$ (5 marks)
- b) Given $f(x) = 2^x$. Show that $f(x+3) - f(x-1) = \frac{15}{2}f(x)$ (5 marks)
- c). Give any four types of function and graph three of the functions. (5 marks)

✓ **Question 2**

- (a) When is the limit of a function $f(x)$ said to exist at x_0 . (3 marks)

- (b) Evaluate the following limits

(i) $\lim_{x \rightarrow 0} \frac{x^3 - 6x^2 + 12x - 8}{x^3 - 3x^2 + 4}$ (5 marks)

(ii) $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x - 3}$ (4 marks)

(iii) $\lim_{x \rightarrow \infty} \frac{2x^3 - 3x^2 + 1}{x^3 + 2x^2 - 3}$ (3 marks)

✓ **Question 3**

- a) Define the continuity of a function $f(x)$ at a point x_0 . (4 marks)

- b) Let $f(x) = \begin{cases} \left(\frac{x^3-27}{x-3}\right), & x \neq 3 \\ 27, & x = 3 \end{cases}$. Is the function $f(x)$ continuous or discontinuous? (4 marks)

- c) Define Jump discontinuity, hence show that the function $f(x) = \frac{[x]}{x}$ has a jump discontinuity at $x = 0$. (7 marks)

Question 4

- a) Use the first principle to find the differential coefficient of the function $g(x) = \frac{2x-1}{x+3}$ with respect to x . (6 marks)
- b) Find the gradient of the curve $xy - \sqrt{x} = y(1 - x^2)$ at the point (1,0) (5 marks)
- c) If $x^2y + xy^2 = 1$. Find $\frac{dy}{dx}$ (4 marks)

Question 5

- a) Show that $\frac{d}{dx} \cos^{-1} x = -\frac{1}{\sqrt{1-x^2}}$ where $-1 < x < 1$. (3 ½ marks)
- b) Using logarithm, find the differential coefficient of $y = e^{2x} \sin 2x$. (4 ½ marks)
- c) Differentiate the following functions with respect to x :
- (i) $y = \frac{1 + \tan x}{\sec x}$ (3 ½ marks)
- (ii) $y = \log_{10}(3x^2 + 4x)$ (3 ½ marks)

Question 6

- a) Find $\int \tan \theta d\theta$ (4 marks)
- b) If $\frac{d^2y}{dx^2} = 6x$; find y in terms of x , when it is known that if $x = 1$; $\frac{dy}{dx} = 10$ and when $x = 2$; $y = 25$ (6 marks)
- c) Find $\int \frac{dx}{16x^2 + 9}$ using the transformation $\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \tan^{-1} \frac{x}{a}$ (5 marks)