



# UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

## FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: GL 121

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COURSE NAME: TRIGONOMETRY AND CALCULUS

CLASS: GD 1

TIME: 3 HOURS

Name: \_\_\_\_\_ Index Number: \_\_\_\_\_

**Answer ONLY three (3) questions. All questions carry equal marks. All working must be clearly done in the Answer Booklet provided.**

### Question 1

- a. If  $\tan A = \frac{1}{3}$  and  $\tan B = \frac{3}{4}$ , both A and B being acute angles, find the value of  $\tan(A + B)$
- b. Find the integral  $\int e^{5x+2} dx$
- c. From first principles, evaluate  $g'(1)$  if  $g(x) = \frac{x-1}{x+2}$
- d. Express as a single ratio
- i)  $\cos 32^\circ \cos 48^\circ - \sin 32^\circ \sin 48^\circ$                       ii)  $\frac{1}{\sin 46^\circ \cos 44^\circ + \cos 46^\circ \sin 44^\circ}$

### Question 2

- a. If  $\sin A = \frac{4}{5}$  and  $\cos B = \frac{2}{3}$ , find the value of  $\sin(A+B)$  and  $\cos(A+B)$  without using tables, if
- i) A and B are both acute angles
- ii) A is obtuse and B is acute
- b. Find the derivative with respect to  $x$
- i)  $x^3 - 3xy + y^3 = 2$                       ii)  $f(x) = x^2 \sin x$
- c. Find the integral  $\int x \sin 3x dx$
- d. Use the algebraic technique of factorization to find the  $\lim_{x \rightarrow 3} \left[ \frac{x^2 - 9}{x^2 - x - 6} \right]$

### Question 3

- a. Express  $2\sin x + \cos x$  in the form  $R\sin(x + \alpha)$ , where  $R > 0$  and  $0 < \alpha < 90$ . Hence find the truth set of the equation  $2\sin x + \cos x = 1.866$ .
- b. Express  $\sin 3x + \sin x$  as a product.
- c. Evaluate the following integrals
- (i)  $\int \frac{6x^2}{x^3 - 4} dx$                       (ii)  $\int x^2 e^{2x} dx$
- d. Given that  $y = 3u^2 + 1$  and  $u = 4x^2 + 1$ , find  $\frac{dy}{dx}$

### Question 4

- a. If  $\tan \theta = \frac{3}{4}$ , find without using tables
- i)  $\sin 2\theta$                       ii)  $\tan 2\theta$
- b. Prove that  $\sin 2A = \frac{2 \tan A}{1 + \tan^2 A}$
- c. Solve  $\int x^2 \ln x dx$
- d. Find the stationary points of  $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x$  and determine the type.

*Examiner: M V Crankson*