



# TECHNICAL UNIVERSITY OF MOMBASA

## Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR DEGREE OF:

**BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**  
**BACHELOR OF STATISTICS & COMPUTER SCIENCE**  
**BACHELOR OF SCIENCE IN CIVIL ENGINEERING**  
**(BSSC/BSIT/BSC 2/BCE 14M, BSC 02)**

AMA 4105/AMA 4205/SMA 2173/SMA 2102: CALCULUS II

**END OF SEMESTER EXAMINATION**

**SERIES: DECEMBER 2014**

**TIME ALLOWED: 2 HOURS**

### **Instructions to Candidates:**

You should have the following for this examination

- *Mathematical tables*
- *Scientific Calculator*

This paper consist of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

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### **Question One (Compulsory)**

a) Determine the following integrals:

- (i)  $\int_1^2 4e^{2x} dx$  (3 marks)
- (ii)  $\int_2^3 x(x-1)^4 dx$  (3 marks)
- (iii)  $\int_0^{\pi/2} \sin x dx$  (3 marks)

$$y = \frac{1}{2}x^2$$

b) Find the area between the curve, the y axis and the straight line  $y = 2$  (4 marks)

$$\frac{11x+12}{(2x+3)(x-3)}$$

c) Express in partial fractions (3 marks)

$$\int_1^3 \frac{2}{\sqrt{x}} dx$$

d) Use the mid ordinate rule with 4 intervals to evaluate correct to 3 decimal places. (4 marks)

$$y = x^2 + 4$$

e) The curve is rotated one revolution about the x axis between the limits  $x = 1$  and  $x = 4$ . Determine the volume of solid for revolution produced (4 marks)

f) Using integration by parts, find:

$$\int \tan^{-1} x dx$$

(4 marks)

g) A particle moves along the y axis with the velocity  $v = 2t + 5$ , how far does the particle move between the times  $t = 0, t = 2$  (2 marks)

### Question Two

$$y = x^2 + 1 \quad y = 7 - x$$

a) Determine by integration the area enclosed by the curves and (8 marks)

$$\int \sqrt{a^2 - x^2} dx$$

b) By making a suitable substitution, find (8 marks)

$$\int \frac{4x-1}{(x+1)(x-2)} dx$$

c) Find the using partial fractions (4 marks)

### Question Three

$$\int \sin^n x dx$$

a) (i) Derive a reduction formula for (4 marks)

$$\int_0^{\pi/2} \sin^8 x dx$$

(ii) Use the reduction formula above to evaluate (4 marks)

$$\int_0^4 5x\sqrt{2x^2 + 4} dx$$

b) Evaluate taking positive values of roots only (5 marks)

$$\int \frac{1}{\sqrt{1-x^2}} dx$$

- c) Find **(5 marks)**  
**Question Four**

$$y = x^3 - x^2 - 6x$$

- a) Sketch the curve between  $x = -2$  and  $x = 3$ , hence determine the area between the curve and the x axis **(8 marks)**

$$y = \int \left( r + \frac{1}{r} \right)^2 dr$$

- b) If , find the value of the arbitrary constant of integration if  $y = 1/3$  when  $r = 1$  **(5 marks)**

$$\frac{(3x-1)}{x^2-x-6} \qquad \int \frac{3x-1}{x^2-x-6} dx$$

- c) Express in partial fraction and hence evaluate: **(7 marks)**

### Question Five

- a) Evaluate:

$$\int \sin 2x \cos 3x dx$$

**(3 marks)**

$$y = x^{3/2}$$

- b) Find the length of the arc of the curve from the point (1, 1) to the point (4, 8) **(6 marks)**

$$\int_1^3 x^4 dx$$

- c) Use trapezoidal rule to find an approximate value for taking  $n = 8$  **(5 marks)**

- d) The region R between curve  $y = 2 - x^2$  and  $y = x^2$  is rotated about x axis generating a solid S. Find the volume of S **(6 marks)**