(31)

EMBU UNIVERSITY COLLEGE
(A CONSTITUENT COLLEGE OF THE UNIVERSITY OF NAIROBI)

SECOND SEMESTER EXAMINATIONS 2013/2014

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SMA 104: CALCULUS II

DATE: APRIL 9, 2014 **TIME: 11.00AM - 1.00PM**

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE

(a) Evaluate $\int \sin 3x dx$ (3 marks)

(b) Integrate $\int 3^x dx$ (3 marks)

(c) Show that

$$\int \frac{1}{x^2 - a^2} dx = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + c$$ (6 marks)

(d) Verify Lagrange's Mean Value Theorem for,
$f(x) = (x-1)(x-2)(x-3)$, in $[0,4]$. (5 marks)

(e) Find the area bounded by the curves $y = x^2$ and $y = 2x$ (5 marks)

(f) Evaluate $\int \frac{dx}{\sqrt{4x - x^2 - 3}}$ (5 marks)

(g) Evaluate $\int x^2 e^{x^3} dx$ (3 marks)

QUESTION TWO

(a) Show that

$$\int e^{mx} \sin x dx = \frac{e^{mx}}{1+m^2} [m \sin x - \cos x]$$ (8 marks)

(b) Find the Maclaurin series for $\log(1+x)$ and $\log(1-x)$.

Hence deduce the expression for $\left[\frac{\log(1+x)}{\log(1-x)}\right]$. (12 marks)

QUESTION THREE

(a) Evaluate $\int \frac{1}{3-2x}dx$ (3 marks)

(b) Integrate $\int \frac{1}{x^2+6x+7}dx$ (5 marks)

(c) Show that

$$\int \frac{1}{x^2+a^2}dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)+c$$ (6 marks)

(d) Verify Rolle's Theorem for $f(x)=(x-a)^3(x-b)^4$ in $[a,b]$. (6 marks)

QUESTION FOUR

(a) Integrate the following functions

(i) $\int \cos^2 x \sin^3 x dx$ (5 marks)

(ii) $\int \cos^2 x \sin^2 x dx$ (5 marks)

(b) Use Taylor's theorem to calculate the value of $\sin(30.02)^\circ$ up to the 4^{th} term. (10 marks)

QUESTION FIVE

(a) Integrate $\int \sin^4 x dx$ (5 marks)

(b) Find the area bounded by the curves $y^2 = x$ and $y = x-2$ (6 marks)

(c) Express $\frac{1}{(x+1)(x^2+1)}$ as a sum of partial fractions. (5 marks)

Hence, evaluate $\int\left(\frac{1}{(x+1)(x^2+1)}\right)dx$ (4 marks)

---END---