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OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2019 /2020 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE CS/ASC

COURSE CODE: MAT 210

COURSE TITLE: CALCULUS II

DATE: 5th DEC 2019 **TIME: 9AM-12PM**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES **PLEASE TURN OVER**

MAT 210: CALCULUS II

STREAM: BSc (ASC) **DURATION: 3 Hours**

INSTRUCTION TO CANDIDATES

i. *Answer **ALL** questions from **section A** and any **THREE** from **section B***

ii. *Do not write on the question paper.*

SECTION A (31 MARKS): Answer all questions in this section.

QUESTION ONE (16 MARKS)

a) State mean value theorem (2 Marks)

b) Find a value of c such that the conclusion of the mean value theorem is satisfied for $f(x)=-2x^3+6x-2$ on the interval $[-2,2]$ (4 Marks)

c) Use the mean value theorem to prove that for any two real numbers a and b, $|\cos a-\cos b|\leq|a-b|$ (4 Marks)

d) Evaluate $\int x(x-5)^5\,dx$ (4 Marks)

e) Find the maclaurin series of x^2e^x at x=0 (2 Marks)

QUESTION TWO (15 MARKS)

a) State Taylor's Theorem (2 Marks)

b) Find the first 4 terms of the Taylor series for the following functions:

i) $\ln x$ centered at $a=1$ (3 Marks)

ii) $\frac{1}{x}$ centered at $a=1$ (3 Marks)

iii) $\sin x$ centered at $a=\frac{\pi}{4}$ (2 Marks)

c) Evaluate

i. $\int_2^3 \frac{1}{x} dx$ (3 Marks)

ii. $\int \ln(x-2)^2$ (2 Marks)

SECTION B [39 MARKS]: ANSWER ANY THREE QUESTIONS IN THIS SECTION

QUESTION THREE (13 MARKS)

a) Use substitution to evaluate to evaluate $\int \sin 5x dx$ (4 Marks)

b) Work out $\int_0^1 \int_{\sqrt{x}}^{x+1} (2xy) dy dx$ (6 Marks)

c) Integrate $\int \frac{2-x}{x^2+5x} dx$ (3 Marks)

QUESTION FOUR (13 MARKS)

a) Use integration by parts to evaluate $\int xe^x dx$ (5 Marks)

b) Evaluate $\int \tan^2 x \sec^4 x dx$ (5 Marks)

c) Integrate $\int \frac{dx}{\sqrt{49-x^2}} dx$ (3 Marks)

QUESTION FIVE (13 MARKS)

(a) If $y = x^2tz + 3xt^5z$ find $\frac{\partial^2 y}{\partial x \partial t}$ (5 Marks)

(b) Find the value of x_0 given that $f(x) = x^3 - 3x^2 - 10x + 20$ on the interval $(-1,5)$ such that

$f'(c) = \frac{f(b) - f(a)}{b-a}$ where $a = -1$, & $b = 5$ (8 Marks)

QUESTION SIX (13 MARKS)

a) Calculate $\int [3\sqrt{x} + \sin x] dx$ (3 Marks)

b) Find the area of the region bounded above in $y = x + 6$ and $y = x^2$ between 0 and 2 (5 Marks)

c) Evaluate $\int_1^2 \int_3^4 (y - x) dy dx$ (5 Marks)

QUESTION SEVEN (13 MARKS)

Evaluate the following integrals

a) $\int x \sin^4(3x^2 + 6)\cos(3x^2 + 6) dx$ (7 Marks)

b) $\int x^2 \sin x dx$ (6 Marks)