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OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, RESEARCH AND STUDENTS' AFFAIRS

UNIVERSITY EXAMINATIONS

2018 /2019 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (APPLIED STATISTICS)

COURSE CODE: **MAT 210**

COURSE TITLE: **CALCULUS II**

DATE: 14TH DECEMBER, 2018 **TIME: 9.00 AM – 12.00 PM**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

THIS PAPER CONSISTS OF 5 PRINTED PAGES **PLEASE TURN OVER**

MAT 210

REGULAR-MAIN EXAM

MAT 210: CALCULUS II

STREAM:BSC(APP.Stat) **DURATION:3 Hours**

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INSTRUCTION TO CANDIDATES

i) Answer **ALL** questions in **SECTION A** and any other **THREE** questions in **SECTION B**.

ii) Do not write on the question paper.

SECTION A: [31 MARKS]

Question One : [16 marks]

a) Evaluate the given integrals

i) $\int(2e^x + \frac{6}{x} + ln2)dx$ 3mks

ii) $\int \frac{x^2+3x-2}{\sqrt{x}}dx$ 3mks

iii)Compute the area bounded between the curves

$y = x^3$ and $y = 4x$ 3mks

b) Compute the following double integral over the indicated rectangle.

$\int\int \frac{1}{(2x+3y)^2}dxdy$, D=[0,1]X[1,2]. 3mks

c) Evaluate the following definite integral.

$\int_{ln\frac{1}{2}}^{2}(e^t - e^{-t})dt$ 4mks

Question Two : [15 marks]

a) Find the first 4 terms of the taylors series for the function $\ln x$ centered at $a = 1$. 4mks

b) Find the following antiderivatives:

i) $\int e^{2x} cos(x) dx$ 3mks

ii) $\int sin^2 x cos^2 x dx$ 3mks

c) Determine all the numbers c which satisfy the conclusions of the mean value theorem for the following function

$h(z) = 4z^3 - 8z^2 + 7z - 2$ on [2,5]. 5mks

SECTION B: [39 MARKS]

Question Three : [13 marks]

Compute the following double integrals

a) $\int_2^4 \int_1^2 6xy^2 dy dx$ 2mks

b) $\int_0^1 \int_1^2 \frac{1}{(2x+3y)^2} dy dx$ 3mks

c) $\int_{-1}^2 \int_0^1 x e^{xy} dy dx$ 3mks

d) $\int_0^1 \int_{-2}^{-1} x^2y^2 + cos(\pi x) + sin(\pi y) dy dx$ 3mks

e) $\int_{-2}^3 \int_0^{\frac{\pi}{2}} x cos^2(y) dy dx$ 2mks

Question Four : [13 marks]

Let f be twice differentiable function such that $f(2) = 5$ and $f(5) = 2$.

Let g be the function given by $g(x) = f(f(x))$.

a) Explain why there must a value c for $2 < c < 5$ such that $f'(c) = -1$.

3mks

b) Show that $g^{'}(2) = g^{'}(5)$. Use this result to explain why there must be a value k for $2 < k < 5$ such that $g^{''}(k) = 0$ 4mks

c) Show that if $f^{''}(x) = 0$ for all x, then the graph of g does not have a point of inflection. 3mks

d) Let h(x)=f(x)-x. Explain why there must be a value r for $2 < r < 5$ such that $h(x) = 0$ 3mks

Question Five: [13 marks]

a) Evaluate the following integral

$\int\int\int_B 8xyzdv$, B=[2,3]x[1,2]x[0,1] 4mks

b) Determine the following antiderivatives

i) $\int sinxcos^2 2xdx$ 4mks

ii) $\int \frac{2x-3}{x^3-3x^2+2x}dx$ 5mks

Question Six : [13 marks]

a) Find the Taylor series for $f(x) = x^4 + x - 2$ about $a = 1$ 4mks

b) Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the following functions

i) $f(x, y) = (x^2 - 1)(y + 2)$ 3mks

ii) $f(x, y) = e^{x+y+1}$ 3mks

iii) $f(x, y) = e^{-x} sin(x + y)$. 3mks

Question Seven : [13 marks]

a) Determine if the following sequences converge or diverge. If the sequence converges determine its limit.

i) $\left\{\frac{3n^2-1}{10n+5n^2}\right\}_{n=2}^{\infty}$ 3mks

ii) $\left\{\frac{(-1)^n}{n}\right\}_{n=1}^{\infty}$ 3mks

b) Compute $\int x^2 arctan(2x)dx$ 3mks

c) Evaluate $\int\int_D 4xy - y^3 dA$, D is the region bounded by $y = \sqrt{x}$ and $y = x^3$. 4mks

END