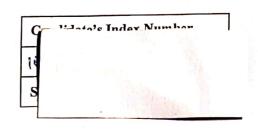
JANUARY 2024 MAT 302SW ADVANCED CALCULUS II 1 HOUR 20 MINUTES



UNIVERSITY OF CAPE COAST COLLEGE OF EDUCATION STUDIES SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH INSTITUTE OF EDUCATION

FIVE-SEMESTER BACHELOR OF EDUCATION (SANDWICH) PROGRAMME LEVEL 400, END-OF-FIRST SEMESTER EXAMINATION, JANUARY 2024

8TH JANUARY 2024

ADVANCED CALCULUS II

9:40 AM - 11:00 AM

SECTION B [40 MARKS]

Answer any TWO questions from this section.

Please, note that if you answer more than three questions, only the first three will be marked.

- 1. a. Find the derivative of $r(t) = at \cos(3t) i + b \sin^3 t j + c \cos^3 t k$. [7 marks]
 - b. Evaluate $\int_C ydx + z dy + xdz$ where C is the line segment from (2, 0, 0) to (3, 4, 5). [13 marks]
- 2.

 a. Let S be the portion of the plane x + y + z = 1 over $D = \{(x, y): 0 \le x \le 1, 0 \le y \le 1 x\}.$ Use Stoke's Theorem to evaluate $\int_C F \cdot dr$, where the surface S is the planar region enclosed by C.

 [12 marks]
 - b. Evaluate $\oint_C y^2 dx + 3xy dy$, where the region *D* enclosed by *C* is given by $D = \{(r, \theta): 1 \le r \le 2, 0 \le \theta \le \pi\}.$ [8 marks]

3.

a. Let
$$f(x, y) = x^2y^3 - 4y$$
. Find

i.
$$\nabla f(x,y)$$

[4 Marks]

- ii. the directional derivative of f in the direction of the vector v = 2i + 5j using your answer in part (i). [8 marks]
- b. Evaluate the integral $\int_0^1 \left(\frac{4}{1+t^2} j + \frac{2t}{1+t^2} k \right) dt$.

[8 marks]

4.

- a. Evaluate $\oint_C y^2 dx + 3xy dy$, where the region D enclosed by C is given by $D = \{(r, \theta): 1 \le r \le 2, 0 \le \theta \le \pi\}$. [8 marks]
- b. Prove that the line integral

$$\int_{(-1,2)}^{(3,1)} (y^2 + 2xy) dx + (x^2 + 2xy) dy$$

is independent of path and find its value.

[12 marks]

$$4(i+t^{2})$$

$$4(i+t^{2})$$

$$4(i+t^{2})$$

$$-4(i+t^{2})^{2}$$

$$-6t(i+t^{2})^{2}$$

$$-6t}{(i+t^{2})^{2}}$$

$$-6t}{(i+t^$$