Tougaloo College
MAT222 - Calculus II
MID-EXAM - Spring, 2025

Duration : 50 min **March 19, 2025**

Name : .....

ID Number : .....

Instructions to Candidates

- Calculators are **NOT** allowed.
- This paper consists of 6 questions.
- Answer all questions.
- All questions carry marks as indicated for each question or part thereof.
- All drawings or sketches, if any, should be produced clearly.
- Assume reasonable values for any data not given with the question paper. Clearly state any assumptions.

1. Use Midpoint Rule with the value $n = 5$ to approximate the integral (no need to simplify your answer):

$$\int_0^1 \sqrt{x+1}\, dx$$

Total for Question 1: 10 Points

2. Evaluate the integrals:

(a) $\int_0^1 (x^e + e^x)\ dx$ (10 Points)

(b) $\int_{-2}^1 \frac{1}{x^4}\ dx$ (10 Points)

(c) $\int 4x^3 e^{x^4}\ dx$ (10 Points)

(d) $\displaystyle\int_1^2 \frac{e^{1/x}}{x^2}\, dx$ (10 Points)

(e) $\displaystyle\int \sin^3\theta \cos^4\theta \; d\theta$ (10 Points)

Total for Question 2: 50 Points

3. Sketch the region enclosed by the given curves, then find the area of the region.

$$y = \sin x,\ y = x,\ x = \pi/2,\ x = \pi.$$

Total for Question 3: 20 Points

4. Use the washer or cylindrical shell method to find the volume of the solid obtained by rotating the region bounded by the curves $y^2 = x$ and $x = 2y$ about the $y-$axis.

Total for Question 4: 20 Points

5. Find the average value of the following function on the interval $[-1, 1]$.

$$f(x) = \frac{x^2}{(x^3+3)^2}$$

Total for Question 5: 10 Points

6. Evaluate the following integral using integration by parts.

$$\int t^2 \sin \beta t \; dt,$$

where β is a constant.

Total for Question 6: 15 Points