**JOUST**

**KOSELE**

**SMA200: CALCULUS II.**

**QUESTION 1 [30MKS]:[COMPULSORY]:**

1. (a) Evaluate the integral (3mks)

$$\int \tan^{-1} x \, dx$$

(b)Evaluate the following integrals:

(i) $\int \frac{dx}{4x+5}$(3mks).

(ii) $\int \frac{1}{x^2-2x+5} dx$ (4mks)

(c) Find the area between the curves **f(y) = (3-** $x^2$**)** and **g(y)=(y+1).**(4mks).

(d) Find the intercepts of f(x) =$x^2 - 3x + 2$ and show that f'(x) =0 at some point between the two curves. (5mks).

(e)Find the volume of the solid formed by revolving the region bounded by **f(x)=(2-**$x^2$) and g(x)=1 about the line **y=1.**(5mks).

(f) Find the arc length of the curve given by **f(x) =** $\frac{2}{3}x^{1.5}+\frac{1}{x}$(6mks).

**QUESTION 2.[20MKS]:**

(a).Find the area of the surfaceobtained by revolving the curve

f(x)=$x^3$ on the interval $0 \leq x \leq 1$about the x-axis. (7mks).

(b) Evaluate the integral:

$\int x^2 e^x \, dx$(6mks).

(c) Express as the following fractions as a sum of partial fractions :

**(i)** $\frac{x-1}{3x^2-11x+10}$.

(ii) $\int \frac{x-1}{3x^2-11x+10} dx$(7mks).

**QUESTION 3[20MKS]:**

(a) Evaluate the $\lim_{x\to 0} \frac{e^{2x-1}}{x}$(3mks).

(b) Using the change of variable **t=tan $x$**; Find $\int \frac{1}{1+\sin^2 x}\, dx$(6mks).

(c)Taking$I_n = \int_0^{\frac{\pi}{2}} \cos^n x\, dx$, show that $\int_0^{\frac{\pi}{2}} \cos^2 x\, dx = \left(\frac{n-1}{n}\right) I_{n-2}$,(11mks).

Where n≥ 2

**QUESTION 4. (20MKS):**

(a).(i) Prove that $\int_0^1 x^2 e^{2x} = \frac{e^2}{4} - \frac{1}{4}$(4mks).

(ii) $\int \frac{2x+3}{x^2+2x+3}\, dx$(6mks).

(b) $\int_1^2 \frac{x^2+2}{x+1}\, dx$(6mks).

(c) If f(x) =(5- $\frac{4}{x}$), find all c in the interval(1, 4) such that

f'(c) = $\frac{f(4)-f(1)}{(4-)}$(4mks).

**QUESTION 5 [20MKS]:**

(a) Evaluate the following:

(i) $\int \sin^5 x \, dx$(5mks)

(ii) Find the approximate value of $\sqrt[10]{1.01}$(5mks)

(b) (i)Using the first four terms ,show that the approximate value of

$e^x$= 1+x+$\frac{x^2}{2!}+\frac{x^3}{3!}$+.....(5mks)

(ii) Calculate the volume of the solid formed by revolving the region

Bounded by the curve y=$\sqrt{x}$ and y=$x^2$(6mks).