

**KENYA METHODIST UNIVERSITY
FIRST TRIMESTER EXAMINATION
APRIL 2009**

**FACULTY : ARTS & SCIENCES
DEPARTMENT : COMPUTER INFORMATION SYSTEMS
COURSE CODE : MATH 104
COURSE TITLE : CALCULUS II
TIME : 2HRS
KSPS :**

Instructions: Attempt Question 1 and any other two questions.

Question 1 (30 Mks)

- a) Evaluate $\int x^2 \cos x dx$ (5 Mks)
- b) Evaluate $\int \frac{dx}{1 + \cos x}$ (4 Mks)
- c) Find the area enclosed by the curve $y = x^2 - 5x + 4$ and the x-axis. (5 Mks)
- d) Find the volume obtained by rotating the area under the curve $y = 1 + x$ between $x = 1$ and $x = 2$ about the x – axis. (5 Mks)
- e) Let a, b and m be positive numbers, with $a < b$. Using Limits find the area under the graph $y = mx$, $a \leq x \leq b$ (5 Mks)
- f) i) The acceleration due to gravity on the moon is $1.6 m / s^2$. If a rock is dropped into a crevasse, how fast will it be going just before it hits the bottom 30 seconds later? (3 Mks)
- ii) Evaluate the integral $\int \sin(7x + 5) dx$ (3 Mks)

Question 2 (20 Mks)

- a) Find the area between the curve $y = x^2 - 1$ and $\frac{dy}{dx} y = 2x - 1$ (10 Mks)
- b) Find the Volume of a sphere whose center is the origin, radius r . (7 Mks)
- c) Evaluate $\int \frac{1}{x^2 - 6x + 13} dx$ (3 Mks)

Question 3 (20 Mks)

- a) Find the surface area generated by the loop of the curve $x = t^2$, $y = t - \frac{t^3}{3}$ about the axis. (10 Mks)

- b) Find the position $s(t)$ of a particle moving on a line if:

$$\frac{ds}{dt} = v = 5 \cos \pi t \text{ m/s and } s(0) = 2.$$

Also find the total distance traveled by the particle from $t = 0$ to $t = \frac{3}{2}$ seconds, and the particles displacements for this time periods. (10 Mks)

Question 4 (20 Mks)

- a) Show that if f is continuous on $[a, b]$, and F is any antiderivative of f on $[a, b]$ then

$$\int_a^b f(x) dx = F(b) - F(a) \quad (10 \text{ Mks})$$

- b) Calculate $\frac{dy}{dx}$ if $y = \int_0^{x^2} \cos t dt$ (5 Mks)

- c) Evaluate the integral $\int \frac{\cos 2x}{\sin^3 2x}$ (5 Mks)