

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS
2009/2010 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF COMPUTER
SCIENCE

COURSE CODE: MATH 121

COURSE TITLE: INTEGRAL CALCULUS

STREAM: Y1S2

DAY: FRIDAY

TIME: 2.00 – 4.00 P.M.

DATE: 04/12/2009

INSTRUCTIONS:

- i) Answer question ONE and any other TWO questions
- ii) Begin each question on a separate page
- iii) Show your workings clearly and neatly.

PLEASE TURN OVER

QUESTION ONE (30 MARKS) COMPULSORY

- (a) i) $\int 3e^x + 5 \cos x - 10 \sec^2 x dx$ (4 mks)
- ii) $\int 2 \sec w \tan w + \frac{1}{6w} dw$ (4 mks)
- (b) Use the simpsons Rule with $n=4$ to estimate $\int_0^1 5x^4 dx$ and compare with exact value of the integral (4 mks)
- (c) Evaluate the following integrals by substitution method
- (i) $\int \cos(4x + 5) dx$ (3 mks)
- (iii) $\int x e^{-x^2} dx$ (3 mks)
- (d) Integrate $\int x^4 e^{\frac{x}{2}} dx$ by parts (4 mks)
- (e) Find the area of the region enclosed by $y = x^2$ and $y = \sqrt{x}$ (4 mks)
- (f) Determine the volume of the solid obtained by rotation the region bounded by $y = \sqrt[3]{x}$ $x = 8$ and the x-axis about the x-axis (4 mks)

QUESTION TWO (20 MARKS)

- (a) Integrate the following by parts
- (i) $\int e^\theta \cos \theta d\theta$ (6 mks)
- (ii) $\int w^2 \sin(10w) dx$ (6 mks)
- (b) Evaluate $\int \frac{x^2 - 29x + 5 dx}{(x-4)^2 (x^2 + 3)}$ (5 mks)
- (c) Find $\frac{df}{dy}$ if $f(x,y) = y \sin xy$ (3 mks)

QUESTION THREE (20 MKS)

(a) Determine the reduction formula for $I_m = \int \cos^m x dx$

Use the result to determine I_7 (10 mks)

(b) Approximate $\int_0^2 \frac{1}{x^2+1} dx$ with $n = 4$ using

(i) Trapezoidal Rule (5 mks)

(ii) Simpson's Rule (5 mks)

QUESTION FOUR (20 MKS)

(a) Evaluate $\int \frac{1}{2x^2 - 12x + 21} dx$

(10 mks)

(b) Evaluate the following integrals

(i) $\int 3x^2 \sqrt{x+4} dx$ (6 mks)

(ii) $\int \sqrt{\tan x} \sec^2 x dx$ (4 mks)

QUESTION FIVE (20 MARKS)

(a) Determine the area of the region bounded by $y = 2x^2 + 10$, $y = 4x + 16$, $x = -2$ and $x = 5$

(b) Find the length of the curve $y = \left(\frac{x}{2}\right)^{\frac{2}{3}}$ from $x = 0$ to $x = 2$ (5 mks)

(c) Evaluate the following

(i) $\int \cos^5 \theta d\theta$ (8 mks)

(ii) $\int \cos^2 \theta d\theta$