

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND SEMESTER, 2016/2017 ACADEMIC YEAR

EXAMINATION FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE

UNIT CODE: MATH 121

UNIT NAME: INTEGRAL CALCULUS II

STREAM: Y1S2

EXAMINATION SESSION: APRIL

TIME: 2.00-4.00PM

YEAR: 13/04/2017

INSTRUCTIONS

- (i) Answer ONE and any other TWO questions**
- (ii) Do not write on the question paper**
- (iii) Show your working clearly**

QUESTION ONE (30MKS)

a)(i) A curve passes through the point (4,-2) and its gradient function is $2x^2 + 7$. Find its equation (2Mks)

(ii) Evaluate $\int_0^2 \frac{2x}{x^2 - 5} dx$ (3Mks)

b) i) Evaluate using partial fractions $\int \frac{-2x+4}{(x^2+1)(x-1)^2} dx$ (5mks)

ii) Find the length of the arc of the semicubical parabola $y^2 = x^3$ between the points (1,1) and (4,8). (4mks)

c) i) Use integration by parts to evaluate $\int e^{2x} \sin x \, dx$ (4mks)

ii) Evaluate $\int_0^{\frac{\pi}{6}} \tan 2x \, dx$ (3Mks)

d) (i) . Evaluate $\int 2^{\sin x} \cos x \, dx$ (2Mks)

e) (i) Evaluate the improper integral $\int_0^9 \frac{1}{\sqrt[3]{x-1}} dx$ (4Mks)

ii) Find the area enclosed by the curve $y = x^2 - 4$ and the x-axis (4mks)

QUESTION TWO (20MARKS)

a)i) Evaluate $\int_0^1 \tan^{-1} x \, dx$ (3Mks)

ii) Evaluate the definite integral $\int_1^5 \frac{x}{\sqrt{2x-1}} \, dx$ (4Mks)

b) The region enclosed by the curves $y = x$ and $y = x^2$ is rotated about the x-axis. Find the volume of the resulting solid. (4Mks)

c) Evaluate using Partial fractions $\int \frac{2}{x^2-1} dx$ (4Mks)

d) Evaluate the following improper integrals.

i) $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$ (3mks)

ii) $\int_1^{\infty} \frac{1}{1+x^2} dx$ (2mks)

QUESTION THREE (20MARKS)

a) Find the following integrals by substitution method

i) $\int \frac{x^3}{2x^4+1} dx$ (3mks)

ii) Find $\int_{\frac{\sqrt{2}}{2}}^{\frac{\sqrt{3}}{2}} \frac{1}{\sqrt{1-x^2}} dx$ (3mks)

b) Find the value $\int_0^1 \frac{dx}{1+x^2}$ taking 5 sub-intervals by trapezoidal rule correct to five decimal places. Compare it with the exact value (5mks).

c) Evaluate $\int \frac{x^2}{\sqrt{9-x^2}} dx$ (6Mks)

c) Prove the reduction formula $\int \sin^n x dx = -\frac{1}{n} \cos x \sin^{n-1} x + \frac{n-1}{n} \int \sin^{n-2} x dx$ where $n \geq 2$ is an integer (4Mks)

QUESTION FOUR(20MARKS)

a) Derive a reduction formula $I_m = \int \cos^m x dx$ and use it to solve I_7 (7mks)

b) Show that $\int \frac{1}{a^2+u^2} du = \frac{1}{a} \tan^{-1} \frac{u}{a} + c$ (5Mks)

b) Evaluate $\int \frac{1}{10+x^2} dx$ (4mks)

c) Find the area of the surface obtained by revolving about x-axis of the curve $y = \sqrt{x}$ from $x=0$ to $x=2$. (4Mks)

QUESTION FIVE (20MARKS)

a) Estimate the area under the curve $y = \frac{1}{x}$ between $x=1$ and $x=2$ using $n=10$ by

i. Trapezoidal rule

ii. Simpson's rule (7Mks)

b) Use partial fractions to evaluate $\int \frac{x^2 + 2x - 1}{2x^3 + 3x^2 - 2x} dx$ (5Mks)

c) Find the volume of solid generated by revolving about x-axis of the graph $y = x^2 + 1$ from $x=-1$ to $x=1$ (4mks)

d) Find the area enclosed by the curve $y = x^3 - 4x$ and the x-axis from $x=-2$ to $x=2$ (4mks)

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS
MAIN CAMPUS

FIRST SEMESTER, 2017/2018 ACADEMIC YEAR

**EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER
SCIENCE, BACHELOR OF EDUCATION SCIENCE, BACHELOR OF
EDUCATION ARTS , BACHELOR OF SCIENCE IN ECON/MATH AND
BACHELOR OF SCIENCE IN ECON/STAT**

MATH 121: INTEGRAL CALCULUS II

STREAM: Y2S1 &Y1S2

DATE: 7/12/2017

EXAMINATION SESSION: DECEMBER

TIME: 2.00-4.00 PM

INSTRUCTION TO CANDIDATES:

1. Answer **QUESTION ONE** and **TWO** other questions
2. Do not write on the question paper
3. Show all your working and be neat

QUESTION ONE (30 MARKS)

- a) A company determines that its marginal revenue, in dollars, is expressed by the equation $R'(x) = -0.03x^2 + 500x - 12000$ where x is the number of units sold. They also know that if they have no sales they still must pay operating costs of \$23000.

Find their revenue equation. (3mks)

- b) What is the area under the curve $y(\theta) = 3 \sin \theta$ between $0 = \theta$ and $\frac{\pi}{4}$? (2marks)

- c) Suppose $v = t^2 + 1$ $t - 25$ and $s(1) = 4$. Find $s(t)$ (3marks)

- d) Use integration by parts to evaluate $\int x^2 e^x dx$ (3marks)

- e) prove that $\int \tan x dx = \ln |\sec x| + c$ (3marks)

- f) Evaluate $\int_0^1 x(x^2 + 1)^3 dx$ (4marks)

- g) Integrate the following using substitution techniques

i) $\int \frac{dx}{2 + 2x^2}$ (3marks)

ii) $\int \frac{10x + 3}{x^2 + 16} dx$ (4marks)

- h) Determine the area of the region bounded by $x = -y^2 + 10$ and $x = (y - 2)^2$ (5marks)

QUESTION TWO (20 MARKS)

- a) Given the following information determine the function $f(x)$.

$$f''(x) = 15\sqrt{x} + 5x^3 + 6, \quad f(1) = \frac{5}{4}, \quad f(4) = 404 \quad (6\text{marks})$$

- b) Sketch the graphs $y = 2x^2 + 10$ and $y = 4x + 16$ on the same set of axes. Find the area of the region bounded by these two graphs (8marks)

- c) Evaluate $\int (3t + 5) \cos\left(\frac{t}{4}\right) dt$ (6marks)

QUESTION THREE (20 MARKS)

- a) Integrate $\int x^3 \sqrt{4 - x^2} dx$ (5marks)

- b) Integrate $\int x^2 \sin x dx$ (5marks)

- c) Use partial fraction to evaluate the indefinite integral $\int \frac{x^4 - 5x^3 + 6x^2 - 18}{x^3 - 3x^2} dx$ (10marks)

QUESTION FOUR (20 MARKS)

- a) Derive a reduction formula for any positive integer n and a , that

$$I_n = \int x^n e^{ax} dx = \frac{x^n e^{ax}}{a} - \frac{n}{a} \int x^{n-1} e^{ax} dx \quad (7\text{marks})$$

And hence apply the formula to find constants in the following integral

$$\int x^4 e^{3x} dx = (a_0 x^4 + a_1 x^3 + a_2 x^2 + a_3 x + a_4) e^{3x} + c \quad (5\text{marks})$$

- b) Evaluate the following by partial fraction

$$\int \frac{x^2 + 4}{3x^3 + 4x^2 - 4x} dx \quad (8\text{marks})$$

QUESTION FIVE (20 MARKS)

a) Evaluate the following integral

$$\int x\sqrt{x+1}dx$$

(i) Using integration by part

(5marks)

(ii) Using a standard calculus substitution

(5 marks)

b) Evaluate $\int w^2 \sin(10w)dw$

(7marks)

c) Evaluate $\int \cos(15x) \cos(4x)dx$

(3marks)



UNIVERSITY EXAMINATIONS

THIRD SEMESTER, 2016/2017 ACADEMIC YEAR

**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER
SCIENCE**

MATH 121: INTEGRAL CALCULUS II

STREAM: Y1S2

TIME: 2 .00-4.00PM

EXAMINATION SESSION: AUGUST

YEAR: 27/7/2017

INSTRUCTIONS

- (i) Answer Question ONE and any other TWO**
- (ii) Do not write on the question paper**
- (iii) Show your working clearly**

QUESTION ONE (30MKS)

a)(i) A curve passes through the point (4,-2) and its gradient function is $5x^2 + 7$. Find its equation
(2Mks)

(ii) Evaluate $\int_0^2 \frac{2x}{x^2 - 5} dx$ (3Mks)

b) i) Evaluate using partial fractions $\int \frac{x^2 + 4x + 1}{(x-1)(x+1)(x+3)} dx$ (5mks)

ii) Find the length of the arc of the semicubical parabola $y^2 = x^3$ between the points (1,1) and (4,8).

(4mks)

c) i) Use integration by parts to evaluate $\int e^{2x} \sin x \, dx$ (4mks)

ii) $\int x^3 \ln x \, dx$ (3Mks)

d) (i) . Evaluate $\int 2^{\sin x} \cos x \, dx$ (2Mks)

e) (i) Evaluate the integral $\int \sin^2 x \, dx$ (4Mks)

ii) Find the area enclosed by the parabola $y = 2 - x^2$ and the line $y = -x$. (4mks)

QUESTION TWO (20MARKS)

a)i) Evaluate $\int \sin^{-1} x \, dx$ (3Mks)

ii) Evaluate the definite integral $\int_1^5 \frac{x}{\sqrt{2x-1}} \, dx$ (4Mks)

b) The region enclosed by the curves $y = x$ and $y = x^2$ is rotated about the x-axis. Find the volume of the resulting solid. (4Mks)

c) Evaluate using Partial fractions $\int \frac{2}{x^2 - 1} dx$ (4Mks)

d) Evaluate the following improper integrals.

i) $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$ (3mks)

ii) $\int_1^{\infty} \frac{1}{1+x^2} dx$ (2mks)

QUESTION THREE (20MARKS)

a) Find the following integrals by substitution method

i) $\int \frac{x^3}{2x^4 + 1} dx$ (3mks)

ii) Find $\int_{\frac{\sqrt{2}}{2}}^{\frac{\sqrt{3}}{2}} \frac{1}{\sqrt{1-x^2}} dx$ (3mks)

b) Find the value $\int_0^1 \frac{dx}{1+x^2}$ taking 5 sub-intervals by trapezoidal rule correct to five decimal places. Compare it with the exact value (5mks).

c) Evaluate $\int \frac{x^2}{\sqrt{9-x^2}} dx$ (6Mks)

c) Obtain a formula that expresses the integral $\int \cos^n x dx$ in terms of an integral of a lower power of $\cos x$ (4Mks)

QUESTION FOUR(20MARKS)

a) Derive a reduction formula $I_m = \int \cos^m x dx$ and use it to solve I_7 (7mks)

b) Show that $\int \frac{1}{a^2 + u^2} du = \frac{1}{a} \tan^{-1} \frac{u}{a} + c$ (5Mks)

b) Evaluate $\int \frac{1}{10+x^2} dx$ (4mks)

c) Find the area of the surface obtained by revolving about x- axis of the curve $y = \sqrt{x}$ from $x=0$ to $x=2$. (4Mks)

QUESTION FIVE (20MARKS)

a) Calculate the value of $\int_0^1 \frac{x}{1+x} dx$ using $n=6$ by :

i. Trapezoidal rule

ii. Simpson's rule (7Mks)

b) Evaluate $\int \frac{1}{x(\ln x)^3} dx$ (5Mks)

c) Find the volume of solid generated by revolving about x-axis of the graph $y = x^2 + 1$ from $x=-1$ to $x=1$ (4mks)

d) Evaluate $\int_{-1}^1 3x^2 \sqrt{x^3 + 1} dx$ (4mks)