KABARAK   UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND SEMESTER, 2018/2019 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE AND BSC   IN COMPUTER SCIENCE

MATH 121 CALCULUS II

STREAM: Y2S1   **TIME: 2.00-4.00PM**

EXAMINATION SESSION: JAN-APRIL   **DATE: 1/04/2019**

Instructions to candidates:
- Answer question **ONE** and any other **TWO** questions.

QUESTION ONE (30 marks)

a) Find $\int_0^\infty (1+2x)e^{-x}\, dx$

   (4 marks)

b) Evaluate $\int \dfrac{2x^3 - x^2 + 3x - 1}{\sqrt[3]{x}}\, dx$

   (4 marks)

c) Using $\sin\theta$ substitution

   (i)   Find $\int \dfrac{1}{\sqrt{a^2 - x^2}}\, dx$

          (4 marks)

   (ii)   Hence evaluate $\int_0^2 \dfrac{1}{\sqrt{4 - x^2}}\, dx$

          (3 marks)

d) The average value of a complex voltage waveform is given by:

   $V_{AV} = \dfrac{1}{\pi} \int_0^\pi \left(10\sin t + 3\sin 3t + 2\sin 5t\right) d(t)$. Evaluate V_{AV} correct to 2 decimal places.

   (4 marks)

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e) Find $\int \sin^5 x\, dx$

(5 marks)

f) Show that the volume of solid of revolution produced when the area enclosed by the curves $y = x^2$ and $y^2 = 8x$ is rotated $360°$ about x-axis is 9.6π cubic units.

(6 marks)

QUESTION TWO (20 MARKS)

a) Find

(i) $\displaystyle\int \frac{4}{x^2 + 5x - 14}\, dx$

(3 marks)

(ii) $\displaystyle\int_1^3 2x^2 \ln 2x\, dx$

(4 marks)

b) Evaluate $\displaystyle\int \frac{6x^2 + 3x}{x^2 + 2x - 8}\, dx$

(4 marks)

c) Show that $\displaystyle\int_0^1 \frac{4t^2 + 9t + 8}{(t+2)(t+1)^2}\, dt = 2.546$, correct to 4 significant figures.

(5 marks)

d) The velocity in Km/h of a pipe cub aircraft travelling due west is recorded every minute during the first ten minutes after takeoff. Using Simpson's third rule, estimate the distance travelled.
(4 marks)

Time(min)	0	1	2	3	4	5	6	7	8	9	10
V(t) Km/h	0	80	100	128	144	160	152	136	128	120	136

QUESTION THREE (20 MARKS)

a) Find $\displaystyle\int \frac{d\theta}{2\cos\theta}$

(4 marks)

b) Determine $\displaystyle -\frac{1}{2}\int \frac{d\theta}{1 - \sin\theta}$

(6 marks)

c) Evaluate $\displaystyle\int_0^1 2e^{3x} \sin 2x\, dx$ correct to four significant figures

(6 marks)

d) Find the area enclosed by the curve $y = 10x - x^2$ and the line $y = x^2$
(4 marks)

QUESTION FOUR (20 MARKS)
a) Determine

(i) $\int_{-1}^{0}(3x - 7)^4\, dx$

(4 marks)

(ii) $\int_{0}^{1} 2x\, e^{6x^2 - 1}\, dx$

(4 marks)

b) Evaluate $\int \sin 5t \cos 2t\, dt$

(4 marks)

c) Evaluate $\int_{0}^{1} \tan^{-1} x\, dx$

(3 marks)

d) The electrostatic potential on all parts of aconducting circular disc of radius r is given

$V = 2\pi\rho \int_{0}^{9} \dfrac{R}{\sqrt{R^2 + r^2}}\, dR.$ Show by solving the equation that its volume is given by

$V = 2\pi\rho \left\{ \sqrt{(9^2 + r^2)} - r \right\}.$

(5 marks)

QUESTION FIVE (20 MARKS)

a) Evaluate the following integrals
(i) $\int x^2 \sin\left(4 - 2x^3\right) dx$

(3 marks)

(ii) $\int_{-\infty}^{1} \sqrt{6 - y}\, dy$

(3 marks)

b) Find the integral $\int \cos^2 x \sin^3 x\, dx$

(5 marks)

c) Let $f(x) = (2x - 3)^2$, find the number c that certify the conditions of the Mean value theorem on the interval $[-3, 0]$

(4 marks)

d) Find $f(x)$ if $f''(x) = 6x^2 + 3x - 2$ with the conditions $f'(1) = 4$ and $f(2) = 1$

(5 marks)