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THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2022/2023 – SEMESTER 1

BACHELOR OF PHARMACY HONOURS
FMU3206 – ESSENTIAL MATHEMATICS FOR PHARMACY – LEVEL 3
FINAL EXAMINATION
DURATION: TWO HOURS

DATE: 21st MARCH 2023 TIME: 1.30 P.M.- 3.30 P.M.

INDEX NO :_____

NIC. NO. :_____

IMPORTANT INSTRUCTIONS

- **Formula Sheet** attached (Page 2)
- Write your Index Number in the space provided.
- Answer **all** questions.
- Do not remove any page/part of this question paper from the examination hall.
- Do **Not** keep unauthorized material, including mobile phones and electronic equipment, with you during the examination.
- The use of a nonprogrammable calculator is permitted.
- Use a **pen** (not a pencil) in answering.

INFORMATIONS TO CANDIDATES

- This question paper consists of **10 pages** with **04 Structured Essay Questions.**
- **Total marks awarded = 100**
- Write answers **ONLY** within the space provided.
- Write down all **relevant steps**; marks will be awarded accordingly.

Formula Sheet

Trigonometry

$\sin(A+B) = \sin A \,.\cos B + cosA.sinB$

$cos\,(A+B) = cosA.cosB - sinA.sinB$

$sin(-\theta) = -sin\theta\,;\; cos(-\theta) = cos\theta$

Logarithms

$log_m A + log_m B = log_m AB$

$log_m A - log_m B = log_m A/B$

$log_m A^n = n\, log_m A$

$log_m m = 1$

$log_a b = \dfrac{log_m b}{log_m a}$

Differentiation

$y = ax^n;\; \dfrac{dy}{dx} = anx^{n-1}$

$y = \sin(ax),\; \dfrac{dy}{dx} = a\cos(ax)$

$y = \cos(ax),\; \dfrac{dy}{dx} = -a\sin(ax)$

$y = e^{ax};\; \dfrac{dy}{dx} = ae^{ax}$

$y = \ln ax,\; \dfrac{dy}{dx} = \dfrac{1}{x}$

$y = u.v;\; \dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

$y = \dfrac{u}{v};\; \dfrac{dy}{dx} = \dfrac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

Integration

$\int ax^n dx = \dfrac{ax^{n+1}}{n+1}$

$\int \sin a\theta d\theta = -\dfrac{\cos a\theta}{a}$

$\int cos\; a\theta d\theta = \dfrac{\sin a\theta}{a}$

$\int e^{ax} dx = \dfrac{e^{ax}}{a}$

$\int \dfrac{f'(x)}{f(x)} dx = \ln f(x)$

$\int vdu = uv - \int udv$

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1.

a)

i. Simplify and determine whether it is a real or complex number. **(02 marks)**

$(2i)^2 + (2 - 4i) - (1 - 2i)^2$

ii. Simplify, $(x - 2)^2 + (1 - 2x) + x^2 - (2 - x)^2$ **(02 marks)**

iii. Simplify using your knowledge of indices. **(02 marks)**

$$\frac{a^2 \times (a^3)^2 \times b^{7/2} \times 10^8}{a^4 \times 10^4 \times \sqrt{b^3}}$$

iv. Solve for x. **(02 marks)**

$(x - 1)^2 - 9 = 0$

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v. Solve for x. **(02 marks)**

$2x^2 - 8x + 6 = 0$

b)

i. Using the relevant relationship/s given in the formula sheet, prove that $\cos 90^0 = 0$.
$(sin45^0 = cos45^0 = \frac{1}{\sqrt{2}})$ **(05 marks)**

ii. Using the relevant relationship/s given in the formula sheet, prove that $sin(90 - \theta) = cos\theta$.
$(sin90^0 = 1 \; and \; cos90^0 = 0)$ **(05 marks)**

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iii. Given that $sin^2\theta + cos^2\theta = 1$, prove that $\text{cosec}^2\,\theta - \cot^2\,\theta = 1$ **(05 marks)**

2.

a)

i. Prove that $log_m\,(AxB) = log_m A + log_m B$ **(04 marks)**

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ii. Evaluate (without the aid of a calculator or log tables). **(03 marks)**

$$\left[\frac{log_3 27 \times log_2 16}{log_{10} 10^2}\right][log_2 8 \times 2] + [log_{10} 1000]^2$$

iii. Solve, $\log_3 8 - \log_3 x - 2 = 0$ **(03 marks)**

iv. Given that $log_{10}4 = 0.60$ and $log_{10}2 = 0.30$, evaluate (without the aid of a calculator or log tables), the following: **(06 marks)**

a. $log_4 2$

b. $log_4 8$

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b)

i. Derive the SI units for the followings. **(06 marks)**

a. Force

b. Pressure

c. Density

ii. A solution of 160 cm^3 is made by dissolving 1.17 g of NaCl (Molar mass of NaCl is 58.5 $g\ mol^{-1}$) in water. Calculate the molarity of this solution. **(03 marks)**

3. Find the first differential. **(25 marks)**

i. $y = x^{\frac{1}{2}} + 2x^2 + 5$

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ii. $y = \sqrt{8x^3 - 7}$

iii. $y = xsin\theta$

iv. $y = \frac{e^x}{(x+1)}$

v. Find $\lim_{x \to 3} \frac{x^2-5x+6}{x-3}$

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4.

a) Integrate. **(15 marks)**

i. $\int \left[2x^3 + \sqrt{x} + \frac{1}{x^2}\right] dx$

ii. $\int \frac{2x-4}{x^2-4x+3}\, dx$

INDEX NO :.....

iii. Evaluate $\int_0^{\pi} cos\theta \, d\theta$

b) Find the equation of the curve for which $\frac{dy}{dx} = 3x^2$ which passes through the points (2, 10).

(10 marks)