THE OPEN UNIVERSITY OF SRI LANKA
04 MAR 2022
000081

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2020/2021 – SEMESTER I

BACHELOR OF PHARMACY HONOURS
FMU3206 – ESSENTIAL MATHEMATICS FOR PHARMACY – LEVEL 3
FINAL EXAMINATION
DURATION: TWO (02) HOURS

DATE: 04TH MARCH 2022 TIME: 2.00 P.M.- 4.00 P.M.

INDEX 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 **11 pages** with **04 Structured Essay Questions.**
- **Total marks awarded = 200.**
- Write answers **ONLY** within the space provided.
- Write down all **relevant steps**; marks will be awarded accordingly.

Formula Sheet

Trigonometry

$\sin(A+B) = \sin A.\cos B + \cos A.\sin B$; $\cos(A+B) = \cos A.\cos B - \sin A.\sin B$; $\sin(-\theta) = -\sin\theta$; $\cos(-\theta) = \cos\theta$

Logarithms

(i) $\log_m A + \log_m B = \log_m AB$ *(ii)* $\log_m A - \log_m B = \log_m A/B$

(iii) $\log_m A^n = n \log_m A$ *(iv)* $\log_m m = 1$

(v) $\ln_a b = \frac{\ln_m b}{\ln_m a}$ *(vi)* $ln_b a = \frac{1}{ln_a b}$

Differentiation

(i) $y = ax^{n-1}$; $\frac{dy}{dx} = anx^{n-1}$; *(ii)* $y = sinax$; $\frac{dy}{dx} = acosax$

(iii) $y = cosax$; $\frac{dy}{dx} = -asinax$ (iv) $y = e^{ax}$; $\frac{dy}{dx} = ae^{ax}$

(v) $y = lnax$; $\frac{dy}{dx} = \frac{1}{x}$ $\frac{d}{dx}(b + cx)$ (vi) product; y = uv; $\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$;

(vii) quotient; $y = \frac{u}{v}$; $\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

Integration

(i) $\int \sin a\theta d\theta = -\frac{\cos a\theta}{a}$ (ii) $\int \cos a\,\theta d\theta = \frac{\sin a\theta}{a}$ (iii) $\int e^{ax} dx = -\frac{e^{ax}}{a}$

(iv) $\int \frac{1}{x} dx = ln\, x$ (v) $\int \frac{f^1(x)}{f(x)} dx = ln\, f(x)$ (vi) $\int ax^{n+1} = a\frac{x^{n+1}}{n+1}$

(vii) $\int udv = uv - \int vdu$ (by parts)

Definite Integration

$\lambda \int_a^b f^1(x) = [f(x)]_a^b = f(a) - f(b)$

Index No :.....

1 (a) (i) Simplify and express the answer in the $a + ib$ (complex number) form

$$2i\,[(1-i)^2-(1+i)^2]$$

(ii) Simplify (I) $(a - b)^2 - (a+b)(a-b) + 2b(a-b)$

(II) $\frac{\sqrt{a^3}\times(a^2)^2\times(2^3)^2\times b^2}{\sqrt{a^5}\times b^3\times 8}$ (use your knowledge of INDICES)

Index No :.....

(iii) Solve for x.

(I) $2x^2 - 5x + 2 = 0$

(II) $\left[\frac{1}{2}\right]^{2x+1} = 1$

(III) $\sqrt{x^2 - 5} = 2$

(iv) If $(2.5)^x(0.1)^y = 0.025$ and $(2.0)^x(0.1)^y = 0.02$, solve for x and y

(40 marks)

Index No :.....

(b) Using the relevant relationship/s given in the formula sheet, prove that

(i) sin (A-B) = sinAcosB - cosAsinB,

(ii) sin135 = sin45

(iii) sin2A = 2sinAcosA

(18 marks)

Index No :.....

(c) Prove that secθ -tanθ $= \dfrac{\cos\theta}{1+\sin\theta}$

(06 marks)

2. (a) (i) Prove that $\log_a b = \dfrac{1}{\log_b a}$

(ii) **Without the aid of a calculator or log tables**, evaluate the following:

$$\frac{log_2 8+log_4 64}{log_2 \sqrt{64}} + log_{25} 5$$

(12 marks)

Index No :.....

(b) Given that $\log_{10} 5 = 0.6990$ and $\log_3 10 = 0.4771$,
evaluate (without the aid of a calculator or log tables), the following:

(i) $\frac{\log_{10} 25}{\log_{10} 5} \times \log_{10} 5^2$

(ii) $\log_{10} 2$

(iii) $\log_{10}(45) \times \log_{10} 2$

(18 marks)

Index No :.....

(c) Express the following in SI units

(i) kg cm^2 min^{-1}

(ii) mol dm^{-3}

(iii) kJ g^{-1}

(16 marks)

(d) (i) How many moles of boric acid is contained in 113.0 g of a 10% boric acid ointment? [Chemical formula of boric acid H_3BO_3; exists in the form of colorless crystals or a white powder that dissolves in water] (B=62.0, H = 1.0, O = 16.0)

Index No :.....

(ii) A diabetic patient with insulin resistance is to receive a very concentrated form of regular insulin. Its concentration is 500 units/ vial, and the volume of a vial is 20 mL . How many mL will the patient receive for a 150 unit dose of concentrated regular insulin.

(18 marks)

3 (a) Find the first differential:

(i) $y = \cos\theta\sin\theta$

(ii) $y = \frac{(1-x)^2}{x}$

Index No :.....

(iii) y $= \frac{1}{2}\sqrt{x} - \frac{2}{\sqrt{x}}$

(iv) y = $\sqrt{\frac{2}{x}}$

(32 marks)

4. (a) Integrate:

(i) $\int \frac{2}{(x-1)} - \frac{1}{(x-2)} dx$

Index No :.....

(ii) $\int \left(\sqrt{x} + \frac{1}{3x^2} - \frac{1}{\sqrt{x}}\right) dx$

(iii) $\int 4sinx\ cosxdx$ c

(iv) $\int \frac{3x}{x^2-1}$

(32 marks)

(b) Evaluate $\int_0^{\pi/2} sin2\theta d\theta$

(08 marks)