704
05 NOV 2024
EXAMINATION DIVISION

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2023/2024– SEMESTER II

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

DATE: 05TH NOVEMBER 2024 **TIME: 02.00 P.M.- 04.00 P.M.**

INDEX NO.....

INFORMATION TO CANDIDATES

- **Formula Sheet** attached (Page 10,11).
- 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 materials, including mobile phones and other electronic equipment, with you during the examination.
- The Use of a nonprogrammable calculator is permitted.
- Use a **pen** (not a pencil) in answering.

IMPORTANT INSTRUCTIONS

- This question paper consists of **11 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.

Index No.....

1)

a) Evaluate the following. **(04 Marks)**

i. $\frac{3}{8}+\frac{3}{5}$

ii. $(19-4\div 2)+3\times 2$

b) Simplify the following. **(04 Marks)**

i. $(10^3\times 10^{12})\div 10^2$

ii. $\log_2 32$

c) Solve for x. **(06 Marks)**

i. $2x^2 - 3x + 2 = 0$

ii. $(2x + 3)(x - 1) = x + 5$

d) Resolve the following fraction into Partial fractions **(11 Marks)**

$$\frac{X + 5}{5(X + 2)}$$

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2)

a) Prove that $\log_m (AxB) = \log_m A + \log_m B$ **(05 Marks)**

b) Prove that $\cos(90 - \theta) = \sin(\theta)$, given that $\sin(90)=1$ and $\cos(90)=0$. **(05 Marks)**

c) Prove that $\cot^2\theta + 1 = \operatorname{cosec}^2\theta$ using your knowledge of geometry. **(05 Marks)**

d)

i. The density of a substance is 0.8 g/cm^3. Calculate its density in kg/m^3. **(05 Marks)**

ii. A block has a mass of 10 kg and experiences a force of 50 N. Calculate its acceleration. Express the answer in SI units. **(05 Marks)**

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3)

a) Differentiate the following functions **(12 Marks)**

i. $y = 7x^2 + \frac{5}{x}$

ii. $y = (5x + 2)^3$

iii. $y = \log(3x^2) + e^x$

iv. $y = 5\text{Cos}(x) + 2\text{Sin}(x)$

b) Integrate the following functions of x **(06 Marks)**

i. $\int [5x^2 + e^{2x}]\, dx$

ii. $\int \frac{2x}{x^2 + 6}\, dx$

c) Resolve the following integration. **(07 Marks)**

$\int_0^5 \frac{1}{(x+1)(x-4)}\, dx$

Index No.....

4)

a) Given that $f(x, y, t) = (x^3 + y^2).e^{2t}$, find the values of following. **(06 Marks)**

i. $f(1, 3, 2)$

ii. $f(3, 4, 0)$

b) Find the limit of following. **(08 Marks)**

i. $\lim_{x \to 0} \frac{5x^5 + 2x}{x}$

ii. $\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$

c) A 250 g jar of ointment contains 2% w/w active ingredient. How much active ingredient is present in the entire jar? **(06 Marks)**

d) What is the molarity of a solution containing 1.5 moles of HCl in 2.5 dm^3 of total solution? **(05 Marks)**

Formula Sheet

Trigonometry

$$\sin\theta = \frac{\text{side opposite to angle } \theta}{\text{hypotenuse}}$$

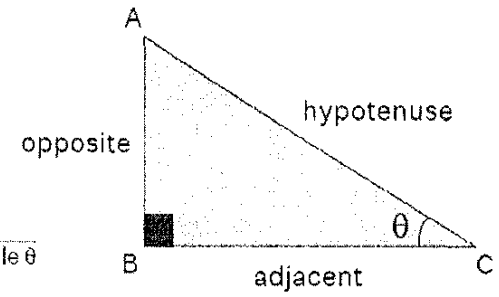
$$\cos\theta = \frac{\text{side adjacent to angle } \theta}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{side opposite to angle } \theta}{\text{side adjacent to angle } \theta}$$

$$\operatorname{cosec}\theta = \frac{1}{\sin\theta} = \frac{\text{hypotenuse}}{\text{side opposite to angle } \theta}$$

$$\sec\theta = \frac{1}{\cos\theta} = \frac{\text{hypotenuse}}{\text{side adjacent to angle } \theta}$$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{\text{side adjacent to angle } \theta}{\text{side opposite to angle } \theta}$$



Differentiation

- $\frac{d}{dx}x^n = nx^{n-1}$
- $\frac{d}{dx}(fg) = fg' + gf'$
- $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{gf' - fg'}{g^2}$
- $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$
- $\frac{d}{dx}(\sin x) = \cos x$
- $\frac{d}{dx}(\cos x) = -\sin x$
- $\frac{d}{dx}(\tan x) = \sec^2 x$
- $\frac{d}{dx}(\cot x) = -\csc^2 x$
- $\frac{d}{dx}(\sec x) = \sec x \tan x$
- $\frac{d}{dx}(\csc x) = -\csc x \cot x$
- $\frac{d}{dx}(e^x) = e^x$
- $\frac{d}{dx}(a^x) = a^x \ln a$
- $\frac{d}{dx}\ln x = \frac{1}{x}$
- $\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$
- $\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$

Logarithms

$\log_a[m \times n] = \log_a m + \log_a n$

$\log_a[\frac{m}{n}] = \log_a m - \log_a n$

$\log_a m^n = n \log_a m$

$\log_a m = \frac{\log_b m}{\log_b a}$

$\log_a m = \log_a n$ then $m = n$

$\log_a a = 1$

$a^{\log_a m} = m$

$\log_a 1 = 0$

$\int a\,dx = ax + C$	$\int x\,dx = \frac{x^2}{2} + C$
$\int x^2\,dx = \frac{x^3}{3} + C$	$\int x^p\,dx = \frac{x^{p+1}}{p+1} + C$
$\int \frac{dx}{x} = \ln\lvert x\rvert + C$	$\int e^x\,dx = e^x + C$
$\int b^x\,dx = \frac{b^x}{\ln b} + C$	$\int \sin x\,dx = -\cos x + C$
$\int \cos x\,dx = \sin x + C$	$\int \tan x\,dx = -\ln\lvert\cos x\rvert + C$
$\int \cot x\,dx = \ln\lvert\sin x\rvert + C$	$\int \sec x\,dx = \ln\left\lvert\tan\left(\frac{x}{2} + \frac{\pi}{4}\right)\right\rvert + C$ $= \ln\lvert\sec x + \tan x\rvert + C$
$\int \csc x\,dx = \ln\left\lvert\tan\frac{x}{2}\right\rvert + C$ $= -\ln\lvert\csc x + \cot x\rvert + C$	$\int \sec^2 x\,dx = \tan x + C$
$\int \csc^2 x\,dx = -\cot x + C$	$\int \sec x \tan x\,dx = \sec x + C$
$\int \csc x \cot x\,dx = -\csc x + C$	$\int \frac{dx}{1+x^2} = \arctan x + C$
$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$	$\int \frac{dx}{1-x^2} = \frac{1}{2}\ln\left\lvert\frac{1+x}{1-x}\right\rvert + C$
$\int \frac{dx}{a^2-x^2} = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert + C$	$\int \frac{dx}{\sqrt{1-x^2}} = \arcsin x + C$
$\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C$	$\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln\lvert x + \sqrt{x^2 \pm a^2}\rvert + C$
$\int \frac{dx}{x\sqrt{x^2-1}} = \operatorname{arcsec}\lvert x\rvert + C$	$\int \sinh x\,dx = \cosh x + C$