UNIVERSITY OF JAFFNA, SRI LANKA
BACHELOR OF PHARMACY
First Year First Semester Examination in B.Pharm. Hons.-2020
PHAPM1181-Pharmaceutical Mathematics

Date : **17.02.2022** **Answer All Questions** Time: One hour

Calculators are not Allowed.

1. (a) i. If α, β are the roots of the quadratic equation $ax^2+bx+c=0$, form a quadratic equation whose roots are
   - $\frac{\alpha}{\beta}, \frac{\beta}{\alpha}$;
   - $\frac{\alpha+1}{\alpha}, \frac{\beta+1}{\beta}$.

   ii. Find the value of k, given that the sum of the roots of the equation $3x^2+kx+5=0$ will be equal to the product of the roots.

   (b) Condense each expression to a single logarithm:

   i. $2(\log 2x - \log y) - (\log 3 + 2\log 5)$;

   ii. $\log_a z + \frac{\log_a x}{2} + \frac{\log_a y}{2}$;

   iii. $-3\log_7 x + 6\log_7 y + 2\log_7(z+3)$.

   (c) Prove that

   i. $(1+\sin\theta)(1-\sin\theta) = \frac{1}{\sec^2\theta}$;

   ii. $\frac{\cot^2 x - 1}{\cot^2 x + 1} = 2\cos^2 x - 1$.

   (d) Show that

   i. $\sin 75^\circ \sin 15^\circ = \frac{1}{4}$;

   ii. $\sin 75^\circ \cos 15^\circ = \frac{2+\sqrt{3}}{4}$;

Continued

2. (a) Find $f'(x)$ if

i. $f(x) = 2\sqrt{x} + 7\sqrt{x^3} - \dfrac{2}{x^2}$;

ii. $f(x) = \dfrac{e^x x^{\frac{1}{3}}}{x^2+3}$;

iii. $f(x) = \sin(\cos \pi x)$;

iv. $f(x) = x^3 \cos(3x^2)$.

(b) Find any relative extrema of each function.

i. $f(x) = 3x^4 - 15x^2 + 12$;

ii. $f(x) = \dfrac{4x}{x^2+1}$;

iii. $f(x) = \dfrac{1}{3}x^3 - 2x^2 + 4x - 1$.

(c) Find the following integrals:

i. $\displaystyle\int \left(\frac{1}{3x} - \frac{3}{2x^2} + e^2 + \frac{\sqrt{x}}{2}\right) dx$;

ii. $\displaystyle\int \left(\frac{e^x}{2} + x\sqrt{x}\right) dx$;

iii. $\displaystyle\int (3x^2 - 1)e^{x^3 - x}\, dx$;

iv. $\displaystyle\int \frac{10x^3 - 5x}{\sqrt{x^4 - x^2 + 6}}\, dx$.

End of Exam