Applied Mathematics for Biomedical Technology

King Saud University

College of Applied Medical Sciences

Biomedical Technology Department

Second Midterm Course Instructor: Dr. Widad Babiker

Course No. 222, first Semester 1440-1441

Date Time: Thursday 22/3/1441 h

الموافق 19/11/2019 م

Time: 90 Minutes

Student's Name	
Student's ID	

Question No.	Q_1	Q_2	Q_3	Q_4	Total
Maximum Marks					
Marks Obtained					

Q. No. 1

i. Simplify:

a. $\frac{1}{4}\log 1+\frac{3}{4}\log 16+\frac{1}{2}\log 9-2\log 2$

b. $\sqrt{e^{2\ln x}}, \quad x>0$

ii. Find the solution of $3^x+1=-2$ if it exists

iii. Change to exponential form. $\log x = y+4$

iv. State the range of possible values of an angle β such that $\cos\beta>0$ and $\tan\beta<0$.

Q. No. 2. Prove the given identities: (**All details are required**)

i. $\dfrac{\tan x - \sin x}{\sin^3 x} = \dfrac{\sec x}{1+\cos x}$

ii. $\dfrac{\cos 2x + \cos x + 1}{\sin 2x + \sin x} = \cot x$

iii. Find $\sin(2\theta)$ and $\cos(2\theta)$ given that $\cos\theta = -\dfrac{24}{25}, \theta$ in quadrant III.

Q. No. 3.

i. Derive (prove) the sines law of an oblique triangle ABC. (**All details are required**)

ii. The current through a diode, I, is given by $I = I_s\left(e^{40V} - 1\right)$ where I is the reverse saturation current and V is the voltage across the diode.

(a) Express V as the subject of the equation.

(b) Evaluate V when $I = 3\times10^{-2}$, $I_s = 1.5\times1o^{-4}$.

Q. No. 4.

i. Graph $f(x) = 2^{x+1} - 3$. State the domain, range, and asymptote. (**All details are needed**)

ii. The voltage gain, measured in decibels (dB), of an amplifier is given by:

gain = $20\log\left(\frac{V_0}{V_i}\right)$ Where V_i is the input voltage and V_0 is the output voltage. The output voltage from an amplifier is 250 mV. If the amplifier has a gain of 17 dB calculates the input voltage**. (All details are needed)**