ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Mathematics & Statistics)

WARNING

1. **PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.**
2. **SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN "AIOU PLAGIARISM POLICY".**

Course: Mathematics-II (1308)

Level: F.A/F.Sc **Semester: Autumn, 2013**

Total Marks: 100 **Pass Marks: 40**

ASSIGNMENT No. 1

(Units 1–5)

Note: Attempt all questions, each question carry equal marks

Q.1 a) Prove that

i) $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

ii) $\sin(\frac{\pi}{4} - \theta) \sin\left(\frac{\pi}{4} + \theta\right) = \frac{1}{2}\cos 2\theta$

b) If $\alpha + \beta + \gamma = 180^\circ$, show that

$\cot\alpha \cot\beta + \cot\beta \cot\gamma + \cot\gamma \cot\alpha = 1$

c) If α, β, γ are the angles of a triangle ABC(not a right angle), then prove that:

$\tan(\alpha + \beta) + \tan\gamma = 0$

Q.2 a) Prove the following identities, state the domain of θ in each case:

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

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

b) If $\cot\theta = \frac{15}{8}$ and the terminal arm of the angle is not in quad. I, find the values of $\cos\theta$ and $\csc\theta$.

(c) Evaluate. $\frac{\tan\frac{\pi}{3} - \tan\frac{\pi}{6}}{1 + \tan\frac{\pi}{3}\tan\frac{\pi}{6}}$

Q.3 a) Prove that: $r_1 r_2 r_3 = rs^2$

b) Prove that: $abc(\sin\alpha + \sin\beta + \sin\gamma) = 4\Delta s$

c) Reduce $sin^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.

Q.4 a) Three villages A, B and C are connected by straight roads 6 km, 9 km and 13 km. What angles these roads make with each other?

b) A plane flying directly above a post 6000 m away from an anti-aircraft gun observes the gun at an angle of depression of 27°. Find the height of the plane.

c) Prove that: $(r_3 - r)\cot\frac{\gamma}{2} = c$

Q.5 a) Find the periods of the following functions:
i) $\tan\frac{x}{7}$ (ii) $3\cos\frac{x}{5}$

b) Draw the graph of each of the following function for the intervals mentioned against each:
i) $y = \tan x$ (ii) $y = \cos\frac{x}{2}$

ASSIGNMENT No. 2

(Units 6–9)

Note: Attempt all questions, each question carry equal marks

Q.1 a) Find the value of θ satisfying the following equations
i) $tan^2\theta - \sec\theta - 1 = 0$ ii) $42sin^2\theta - \sin\theta = 0$

b) Find the solution set of the following equations
i) $\sin x + \sin 3x + \sin 5x = 0$ ii) $\sqrt{3}\tan x - \sec x - 1 = 0$

Q.2 a) Show that: $\sin(2\cos^{-1}x) = 2x\sqrt{1-x^2}$

b) Find the value of each expression
i) $\cos(\sin^{-1}\frac{1}{\sqrt{2}})$ ii) $\csc(\tan^{-1}(-1))$

c) Prove that $\cos^{-1}\frac{63}{65} + 2\tan^{-1}\frac{1}{5} = \sin^{-1}\frac{3}{5}$

Q.3 a) If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c+2, & x > -1 \end{cases}$, find "c" so that $\lim_{x \to -1} f(x)$ exists.

b) Express each limit in terms of e:

i) $\lim_{n \to \infty} \left(1 + \frac{1}{3n}\right)^n$ ii) $\lim_{n \to \infty} \left(\frac{x}{1+x}\right)^x$

Q.4 a) Show that $y = \frac{\ln x}{x}$ has maximum value at $x = e$

b) Apply the Maclaurin series expansion to prove that:

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$$

c) If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$

Q.5 a) If $y = \tan(p \tan^{-1} x)$, show that $(1 + x^2)y_1 - p(1 + y^2) = 0$

b) If $y = (\cos^{-1} x)^2$, prove that $(1 - x^2)y_2 - xy_1 - 2 = 0$

c) Differentiate $\frac{ax+b}{cx+d}$ $w.r.t.$ $\frac{ax^2+b}{ax^2+d}$