ASSIGNMENT 1

EE24BTECH11005 - Arjun Pavanje*

1) Without using tables prove that $(\sin(12°))(\sin(48°))(\sin(54°)) = \frac{1}{8}$ $(1982 - 2Marks)$
2) Show that $16\left(\cos\left(\frac{2\pi}{15}\right)\right)\left(\cos\left(\frac{4\pi}{15}\right)\right)\left(\cos\left(\frac{8\pi}{15}\right)\right)\left(\cos\left(\frac{16\pi}{15}\right)\right) = 1$ $(1983 - 2Marks)$
3) Find all the solution of $4\cos^2(x)\sin(x) - 2\sin^2(x) = 3\sin(x)$ $(1983 - 2Marks)$
4) Find the values of $x \in (-\pi, +\pi)$ which satisfy the equation $8^{(1+|\cos(x)|+|\cos^2(x)|+|\cos^3(x)|+\ldots)} = 4^3$ $(1984 - 2Marks)$
5) Prove that $\tan(\alpha) + 2\tan(2\alpha) + 4\tan(4\alpha) + 8\cot(8\alpha) = \cot(\alpha)$ $(1988 - 2Marks)$
6) ABC is a triangle such that $\sin(2A + B) = \sin(C - A) = -\sin(B + 2C) = \frac{1}{2}$ If A, B and C are in arithmetic progression, determine the values of A, B and C. $(1990 - 5Marks)$
7) If $exp\{\left(\sin^2(x) + \sin^4(x) + \sin^6(x) + \ldots\infty\right) ln2\}$ satisfies the equation $x^2 - 9x + 8$, find the value of $\frac{\cos(x)}{\cos(x)+\sin(x)}$, $0<x<\frac{\pi}{2}$ $(1991 - 4Marks)$
8) Show that the value of $\frac{\tan(x)}{\tan(3x)}$, wherever defined never lies between $\frac{1}{3}$ and 3 $(1992 - 4Marks)$
9) Determine the smallest positive value of x $(indegrees)$ for which $\tan(x + 100°) = \tan(x + 50°)\tan(x)\tan(x - 50°)$ $(1993 - 5Marks)$
10) Find the smallest positive number p for which the equation $\cos(p\sin(x)) = \sin(p\cos(x))$ has a solution $x \in [0, \pi]$ $(1995 - 5Marks)$
11) Find all values of θ in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ satisfying the equation $(1 - \tan(\theta))(1 + \tan(\theta))\sec^2(\theta) + 2^{\tan^2(\theta)} = 0$ $(1996 - 2Marks)$
12) Prove that the values of the function $\frac{\sin(x)\cos(3x)}{\sin(3x)\cos(x)}$ does not lie between $\frac{1}{3}$ and 3 for any real x $(1997 - 5Marks)$
13) Prove that $\sum_{k=1}^{n-1}(n - k)\cos\left(\frac{2k\pi}{n}\right) = -\frac{n}{2}$, where $n \geq 3$ $(1997 - 5Marks)$
14) In any triangle ABC, prove that $\cot\left(\frac{A}{2}\right) + \cot\left(\frac{B}{2}\right) + \cot\left(\frac{C}{2}\right) = \cot\left(\frac{A}{2}\right)\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right)$ $(2000 - 3Marks)$
15) Find the range of values of for which $2\sin(t) = \frac{1-2x+5x^2}{3x^2-2x-1}$, $t \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ $(2005 - 2Marks)$