

# ASSIGNMENT 1

EE24BTECH11005 - Arjun Pavanje\*

- 1) Without using tables prove that  
 $(\sin(12^\circ))(\sin(48^\circ))(\sin(54^\circ)) = \frac{1}{8}$   
 (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  $8^{(1+|\cos(x)|+|\cos^2(x)|+|\cos^3(x)|+\dots)} = 4^3$   
 (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  $\exp\{(\sin^2(x) + \sin^4(x) + \sin^6(x) + \dots \infty) \ln 2\}$  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  $\tan(x + 100^\circ) = \tan(x + 50^\circ) \tan(x) \tan(x - 50^\circ)$   
 (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  $\theta$  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  $t$  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)