ASSIGNMENT 1

EE24BTECH11005 - Arjun Pavanje*

E: Subjective Questions

6. Without using tables prove that $\left(\sin\left(12^{0}\right)\right)\left(\sin\left(48^{0}\right)\right)\left(\sin\left(54^{0}\right)\right) = \frac{1}{8}$
(1982 – 2*Marks*)
7. 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 – 2*Marks*)
8. Find all the solution of $4\cos^2(x)\sin(x) - 2\sin^2(x) = 3\sin(x)$ (1983 – 2*Marks*)
9. Find the values of $x \in (-\pi, +\pi)$ which satisfy the equation $8^{\left(1+|\cos(x)|+|\cos^2(x)|+|\cos^3(x)|+\ldots\right)} = 4^3$
(1984 – 2*Marks*)
10. Prove that $\tan(\alpha) + 2\tan(2\alpha) + 4\tan(4\alpha) + 8\cot(8\alpha) = \cot(\alpha)$
(1988 – 2*Marks*)
11. 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 – 5*Marks*)
12. 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 – 4*Marks*)
13. Show that the value of $\frac{\tan(x)}{\tan(3x)}$, wherever defined never lies between $\frac{1}{3}$ and 3
(1992 – 4*Marks*)
14. Determine the smallest positive value of x (*indegrees*) for which $\tan\left(x+100^{0}\right) = \tan\left(x+50^{0}\right)\tan(x)\tan\left(x-50^{0}\right)$
(1993 – 5*Marks*)
15. 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 – 5*Marks*)
16. 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 – 2*Marks*)
17. 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 – 5*Marks*)
18. Prove that $\sum_{k=1}^{n-1}(n-k)\cos\left(\frac{2k\pi}{n}\right) = -\frac{n}{2}$, where $n \geq 3$
(1997 – 5*Marks*)
19. 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 – 3*Marks*)
20. Find the range of values oft 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 – 2*Marks*)