Class: XI **Subject : Mathematics** **Assignment No. 2**

1. Prove by the principle of Mathematical induction for all natural numbers:
$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ldots\ldots\ldots\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1}$$

2. Prove by the principle of Mathematical induction for all natural numbers:
$$\text{Sin }\theta + \text{Sin }2\theta + \text{Sin }3\theta +\ldots\ldots\ldots\ldots\ldots\ldots.+ \text{Sin }n\theta = \frac{Sin\left(\frac{n+1}{2}\right)\theta.Sin\frac{n\theta}{2}}{Sin\frac{\theta}{2}}$$

3. Prove by the principle of Mathematical induction for all natural numbers:
$(11^{n+2} + 12^{2n+1})$ is divisible by 133.

4. Find the conjugate of $\frac{\left(3+i\sqrt{5}\right)\left(3-i\sqrt{5}\right)}{\left(\sqrt{3}+i\sqrt{2}\right)-\left(\sqrt{3}-i\sqrt{2}\right)}$.

5. If $z = -5 + 2\sqrt{-4}$ then show that $z^2 + 10z + 41 = 0$ and hence evaluate $(z^4+9z^3+35z^2-z+4)$

6. Express the following complex number in polar form:
(i) $(\sqrt{3}+i)$ (ii) $\text{Sin }60^0 + i\text{ Cos }60^0$
(iii) $(1- \text{Cos}\,\theta + i\,\text{Sin}\,\theta)$ (iv) $\frac{1+2i}{1-3i}$ (v) $\left(1+i\sqrt{3}\right)$

7. Solve for x : $21x^2 - 28x + 10 = 0$.

8. Solve for x : $x^2 + 7ix + 6 = 0$.

9. Solve for x : $2x^2 -(3+7i)x - (3-9i) = 0$.

10. Solve: $\frac{3n+1}{3}-\frac{4x+5}{6}\le\frac{4x=1}{6}-\frac{2x+3}{2}$.

11. A solution of 8% boric acid is to be dilated by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 liters of the 8% solution, how many liters of the 2% solution will have to be added?

12. Find the region of the graph where all the inequalities $(x + 2y) \ge 0$, $(2x + y) \le 4$, $x \ge 0$ and $y \le 2$ hold good. Also find the ordered pairs of the vertices of the region.

13. Solve the system of linear inequations graphically:-
$x + 2y \le 8$, $2x + y \ge 2$, $x - y \le 1$, $x \ge 0$, $y \ge 0$

14. Evaluate : (i) $\underset{x\to\pi/4}{Lim}\left(\frac{Co\sec x^2-2}{Cotx-1}\right)$ (ii) $\underset{x\to0}{Lim}\left(\frac{1-Cos5x}{1-Cos6x}\right)$
(iii) $\underset{x\to0}{Lim}\left(\frac{Co\sec x-Cotx}{x}\right)$ (iv) $\underset{x\to\pi/2}{Lim}\left(\frac{\pi}{2}-x\right)\tan x$

15. Evaluate: (i) $\underset{x\to0}{Lim}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{x}\right)$ (ii) $\underset{x\to0}{Lim}\left(\frac{x}{\sqrt{1+x}-1}\right)$ (iii) $\underset{x\to4}{Lim}\frac{3-\sqrt{5+x}}{(1-\sqrt{5-x}}$
(iv) $\underset{x\to a}{Lim}\left(\frac{\sqrt{a+2x}-\sqrt{3x}}{\sqrt{3a+x}-2\sqrt{x}}\right)$ (v) $\underset{x\to a}{Lim}\left(\frac{x\sqrt{x}-a\sqrt{a}}{x-a}\right)$ (vi) $\underset{x\to0}{Lim}\left(\frac{(1+x)^6-1}{(1+x)^2-1}\right)$

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