Second Unit Test, 2014-2015
Maths
Time : 1½ hrs.] Class-XI

[M. M. : 40]

Note: All questions are compulsory.

Section (A)

1) Prove for n=1
\[
\left(1 + \frac{3}{1}\right) \left(1 + \frac{5}{4}\right) \left(1 + \frac{7}{9}\right) \ldots = \left(1 + \frac{(2n+1)}{n^2}\right) = (n+1)^2
\]

2) Express in a+ib form
\[
i^{35} + \frac{1}{i^{35}}
\]

3) Solve \(5x - 3 < 3x + 1\), when \(x\) is an integer.

4) Find total no. of ways of answering 6 multiple choices questions having 4 choices.

(P.T.O.)
Section (B) (4 marks each)

5. Prove that $5^n - 5$ is divisible by 4 for all $n \in \mathbb{N}$. Hence prove that $2.7^n + 3.5^n - 5$ is divisible by 24 for all $n \in \mathbb{N}$.

6. Prove by mathematical Induction: $(n \in \mathbb{N})$

\[
\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \cdots + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}
\]

7. Solve the following system of inequalities graphically:

$3y - 2x \leq 4$,  $x + 3y > 3$,  $x + y \geq 5$,  $y < 4$

8. Find real values of $\theta$ such that

\[
\frac{3 + 2i \sin \theta}{1 - 2i \sin \theta}
\]

is a real number.

9. A solution of 8% boric acid is to be dilute 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 litres of 8% solution, how many litres of 2% solution will have to be added?

10. Find $n$ if

\[
2^{n+1}P_{n-1} : 2^{n-1}P_n = 3 : 5
\]
(3)

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Section (C)

(6 marks each)

11. Out of 6 boys & 4 girls, a committee of 5 is to be formed. In how many ways can this be done if:

   (i) at least 2 girls are included?

   (ii) at most 2 girls are included?

12. (i) Find the number of words which can be made using all letters of the word AGAIN. If these words are written as in a dictionary. What will be the fiftieth word?

   (ii) How many 4-digit numbers can be formed from digits 1, 1, 2, 2, 3, 3, 4, 4, 5, 5?

(P.T.O.)