A PEEJAY COMMON ANNUAL EXAMINATION, 2013
CLASS-XI
MATHEMATICS

TIME ALLOWED: 3 Hrs.                      MAXIMUM MARKS: 100

General Instructions:
1. This paper consists of three sections.
   (a) Section A consists of 10 questions of 1 mark each.
   (b) Section B consists of 12 questions of 4 marks each.
   (c) Section C consists of 7 questions of 6 marks each.
2. All questions are compulsory. However internal choices have been provided in some of the questions in section B and Section C.

SECTION-A

1. Evaluate:
   \[ \lim_{x \to 1} \frac{x^{10} + x^5 + 1}{x - 1} \]

2. If \( f(x) = x + \cos x \), then find \( f'(\pi / 2) \)

3. Write the second term from the end in the expansion of \((1 + x)^7\).

4. Using Binomial theorem, find which number is larger \((1.1)^{10000}\) or 1000.

5. Find the number of permutations of the letters of the word ALLAHABAD.

6. If \( \frac{5 + \sqrt{2}i}{1 - \sqrt{2}i} = x + iy \), find the value of \( x \).

7. Convert \(-4\) radian into degrees.

8. In a \( \triangle ABC \), if \( a = 5 \), \( b = 6 \), \( \sin A = 5/6 \), find \( \angle B \).

9. Find multiplicative inverse of \( \frac{4 - i}{1 + i} \).

10. If \( n(P(A)) = 32 \), how many elements are there in \( A \)?

P.T.O.
\[ y = \frac{x + \sin x}{(x^2 - 1)}. \]

21. Let \( A = \{1, 2, 3, \ldots, 14\} \). Define a relation \( R \) from \( A \) to \( A \) by the rule \( R = \{(x, y) : 3x - y = 0, \) where \( x, y \in A \}. \) Write down its domain, co-domain and range.

22. Prove that:
\[ \cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1. \]

\text{OR}

Prove that:
\[ \frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x. \]

SECTION-C

23. A person standing at the junction (crossing) of two straight paths represented by the equations \( 2x - 3y + 4 = 0 \) and \( 3x + 4y - 5 = 0 \) wants to reach the path whose equation is \( 6x - 7y + 8 = 0 \) in the least time. Find the equation of the path that he should follow.

24. Find the \( n^{th} \) term and the sum of \( n \) terms of the given series,
\[ 2 + 5 + 10 + 17 + 26 + \ldots \ldots \ldots \]

25. (a) Solve for \( x \):
\[ 2\cos^2 x + 3\sin x = 0. \]
(b) Prove that
\[ \sin 3x + \sin 2x - \sin x = 4\sin x \cdot \cos x / \cos 3x / 2. \]

26. How many litres of water will have to be added to 1125 litres of 45% solution of acid so that resulting mixture will contain more than 25% but less than 30% acid content?

\text{OR}

Solve the given system of inequalities graphically,
\[ 3x + 2y \leq 150, \quad x + 4y \leq 80, \quad x \leq 15, y \geq 0, x \geq 0. \]

27. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that
(a) Both Anil and Ashima will not qualify the examination.
(b) Atleast one of them will not qualify the examination.
(c) Only one of them will qualify the examination.

(3) P.T.O.
28. The mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, find the other two observations.

OR

Find the mean, variance and standard deviation for the following distribution.

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<th>Classes</th>
<th>30-40</th>
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<th>50-60</th>
<th>60-70</th>
<th>70-80</th>
<th>80-90</th>
<th>90-100</th>
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<tbody>
<tr>
<td>Frequency</td>
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<td>7</td>
<td>12</td>
<td>15</td>
<td>8</td>
<td>3</td>
<td>2</td>
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</tbody>
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29. (a) Find the equation of the set of points P such that its distances from the points A(3,4,-5) and B(-2,1,4) are equal.

(b) Using the words “necessary and sufficient” rewrite the statement. “The integer n is odd if and only if $n^2$ is odd” . Also check whether the statement is true.