

D. A. V. SENIOR SECONDARY SCHOOL
FIRST TERMINAL EXAM : 2015 – 2016 (MOCK TEST – I)

TIME : 3HRS.

CLASS – XI SUBJECT : MATHEMATICS

Max. Marks : 100

GENERAL INSTRUCTIONS :-

1. All questions are compulsory.
2. SECTION – A comprises of 6 questions of one marks each.
3. SECTION – B comprises of 13 questions of four marks each.
4. SECTION – C comprises of 6 questions of six marks each.

SECTION – A

- Q. 1. Find, $n \left(P \left(P \left(P(\emptyset) \right) \right) \right)$
- Q. 2. In a triangle ABC if, $\tan \left(\frac{A-B}{2} \right) = x \cot \left(\frac{C}{2} \right)$, then find value of 'x'.
- Q. 3. Find the complex number 'z' so that $|z| + 2i = 2z$
- Q. 4. The length of a rectangle is three times the breadth. If the minimum perimeter of the rectangle is 160 cm, then find minimum area of the rectangle.
- Q. 5. Find the total number of triangles that can be formed from 10 points out of which exactly 4 are collinear.
- Q. 6. In a building contains 5 floors, 3 people enter in the lift at ground floor, if each person is free to leave the lift at any floor. Find the number of ways in which the lift can be emptied.

SECTION – B

Q. 7. Prove that : $3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2 = 13$

Q. 8. Using Principle of Mathematical Induction prove that,
for all $n \geq 1$, $1^3 + 3^3 + 5^3 + \dots + (2n - 1)^3 = n^2(2n^2 - 1)$

OR

Using Principle of Mathematical Induction prove that, for all $n \geq 1$, $(n + 3)^2 < 2^{n+3}$

Q. 9. If 'α' and 'β' are two different complex numbers with $|\beta| = 1$, then find $\left| \frac{\beta - \alpha}{1 - \bar{\alpha} \beta} \right|$

Q. 10. Solve the inequation : $\frac{x - 1}{2x + 1} < \frac{x - 3}{2x - 3}$; $x \in \mathbb{R}$

Q. 11. Draw the graph of the function $f(x) = |x - 1| + |x + 1|$, $x \in [-3, 3]$ and also find its range.

Q. 12. If $A \subset B$ then prove that (i) $A \cup B = B$ (ii) $A \cap B = A$

OR

For any two sets A and B, prove that $A \cup B = A \cap B$ if and only if $A = B$.

Q. 13. In how many ways can the letters of the word 'KOLKATA' be arranged so that, the two A's are together but not the two K's.

Q. 14. What is the position of the word 'KOLKATA' if letters of the given word are arranged as in dictionary?

Q. 15. Prove that, $\sqrt{3} \cos 20^\circ - \sec 20^\circ = 4$

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Q. 16. Evaluate : $\sqrt{8 - 15i}$

Q. 17. Let the relation R be defined on N such that $R = \{ (x, y) : x + 2y = 41 ; x, y \in N \}$. What is the domain, co-domain and range of R? Is this relation a function?

Q. 18. A survey shows that 63% of Indians like coffee, whereas 76% likes tea. If x % of Indians like both coffee and tea, find the range of possible values of x .

Q. 19. If, $f = \{(0, 1), (2, 0), (3, -4), (4, 2), (5, 1)\}$ and $g = \{(1, 0), (2, 2), (3, -1), (4, 4), (5, 3)\}$ are any two functions, then find the function $\left(\frac{f}{g}\right)(x)$. Hence write the domain and range of the function $\left(\frac{f}{g}\right)(x)$.

SECTION - C

Q. 20. Convert the complex number $\frac{i - 1}{\cos\left(\frac{\pi}{3}\right) + i \sin\left(\frac{\pi}{3}\right)}$ into polar form.

Q. 21. Using Principle of Mathematical Induction prove that, for all $n \geq 1$, $5^n + 5$ is a multiple of 4 for all $n \geq 1$, $2 \cdot 7^n + 3 \cdot 5^n - 5$ is divisible by 24.

Q. 22. Show that (i) $\cot 3x = \frac{\cot^3 x - 3 \cot x}{3 \cot^2 x - 1}$ (ii) $\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + 2 \cos 16\theta}}}} = 2 \cos \theta$

OR

Solve for 'x': $\tan x + \tan\left(x + \frac{\pi}{3}\right) + \tan\left(x + \frac{2\pi}{3}\right) = 3 \tan x$

Q. 23. If in a triangle ABC, $\frac{b+c}{12} = \frac{c+a}{13} = \frac{a+b}{15}$, prove that $\frac{\cos A}{2} = \frac{\cos B}{7} = \frac{\cos C}{11}$

Q. 24. Solve the system of inequalities graphically :

$$2x + 3y \geq 6, x - 2y \leq 2, 3x + 2y < 12, 2y - 3x \leq 3, x \geq 0, y \geq 0$$

Q. 25. Find the sum of all the four digit numbers that can be formed from 4321 if no digit is used more than once in a number.

Q. 26. In a survey of 100 students, the number of students studying the various languages were found to be : English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24.

Find (i) How many students were studying Hindi?

(ii) How many students were studying English and Hindi?
