

D. A. V. SENIOR SECONDARY SCHOOL

FIRST TERMINAL EXAM : 2015 – 2016 (MOCK TEST – II)

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, $(A \cap B) \cup (A - B)$
- Q. 2. In a triangle ABC, find the value of $(a - b)^2 \cos^2\left(\frac{C}{2}\right) + (a + b)^2 \sin^2\left(\frac{C}{2}\right)$
- Q. 3. If a complex number 'z' lies in the third quadrant, then find the quadrant in which the complex number $-\bar{z}$ will lie.
- Q. 4. The marks obtained by a student of Class XI in first and second terminal examination are 62 and 48, respectively. Find the number of minimum marks he should get in the annual examination to have an average of at least 60 marks.
- Q. 5. For wishing New Year, student of class XI shake hands to one another. If the total number of shake hands is 300, find the number of students in the class.
- Q. 6. If a polygon has 27 diagonals, find the number of sides it can has.

SECTION – B

- Q. 7. Prove that, $\left\{1 + \cos\left(\frac{\pi}{8}\right)\right\}\left\{1 + \cos\left(\frac{3\pi}{8}\right)\right\}\left\{1 + \cos\left(\frac{5\pi}{8}\right)\right\}\left\{1 + \cos\left(\frac{7\pi}{8}\right)\right\} = \frac{1}{8}$
- Q. 8. Prove that : $\cos\left(\frac{\pi}{10}\right) = \frac{\sqrt{10 + 2\sqrt{5}}}{4}$
- Q. 9. Find the polar form of the complex number $\frac{1 + 7i}{(2 - i)^2}$
- Q. 10. Solve the inequation : $\frac{x - 1}{2x + 1} < \frac{x - 3}{2x - 3}$; $x \in \mathbb{R}$
- Q. 11. Find the domain, range of the function, $f(x) = x^2 - 4x + 1$, also draw the graph of the function
- Q. 12. If $A \subset B$ then prove that (i) $A \cup B = B$ (ii) $A \cap B = A$

OR

Let A and B be sets. If $A \cap X = B \cap X = \emptyset$ and $A \cup X = B \cup X$ for some set X, Show that $A = B$.

- Q. 13. How many words can be formed from the letters of the word 'CAUVERI' if the letters are arranged such that no letter gets its own place?
- Q. 14. If letters of the word 'CHENNAI' are arranged as in dictionary, what is the 50th word ?
- Q. 15. Using Principle of Mathematical Induction prove that,
for all $n \geq 1$, $n^3 + (n + 1)^3 + (n + 2)^3$ is divisible by 9.
- Q. 17. Let R be a relation on Q defined by $R = \{(a, b) : a, b \in \mathbb{Q} \text{ and } a - b \in \mathbb{Z}\}$. Check whether
(i) $(a, a) \in R$ for all $a \in \mathbb{Q}$ (ii) $(a, b) \in R \Rightarrow (b, a) \in R$ (iii) $(a, b) \in R$ and $(b, c) \in R \Rightarrow (a, c) \in R$

P.T.O

Q. 16. Let z_1 and z_2 be two complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$.

Then show that, $\arg(z_1) - \arg(z_2) = 0$.

OR

If z_1, z_2, z_3 are complex numbers such that, $|z_1| = |z_2| = |z_3| = \left| \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} \right| = 1$,

Then prove that $|z_1 + z_2 + z_3| = 1$

Q. 18. For three sets A, B and C prove that

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$$

Q. 19. Let $A = \{-1, 0, 1, 2\}$; $B = \{-4, -2, 0, 2\}$ and $f, g : A \rightarrow B$ be functions defined by

$$f(x) = x^2 - x \text{ and } g(x) = 2 \left| x - \frac{1}{2} \right| - 1; x \in A. \text{ Are } f \text{ \& } g \text{ equal? Justify your answer.}$$

SECTION - C

Q. 20. If, $a + ib = \frac{3}{2 + \cos x + i \sin x}$, prove that $a^2 + b^2 = 4a - 3$

Q. 21. Using Principle of Mathematical Induction prove that,

for all $n \geq 1$, $7^{2n} + 2^{3n-3} \cdot 3^{n-1}$ is divisible by 25.

Q. 22. Show that (i) Show that, $\cos 2x \cdot \cos\left(\frac{x}{2}\right) - \cos 3x \cdot \cos\left(\frac{9x}{2}\right) = \sin 5x \sin\left(\frac{5x}{2}\right)$

$$(ii) \cot x \cdot \cot 2x - \cot 2x \cdot \cot 3x - \cot 3x \cdot \cot x = 1$$

OR

$$\text{Prove that, } \sin^3 x + \sin^3 \left\{ x + \frac{2\pi}{3} \right\} + \sin^3 \left\{ x + \frac{4\pi}{3} \right\} = -\frac{3}{4} \sin 3x$$

Q. 23. In a triangle ABC prove that : $a(\cos C - \cos B) = 2(b - c) \cos^2\left(\frac{A}{2}\right)$

Q. 24. Solve the system of inequalities graphically :

$$x + y \leq 4, x + 5y \geq 4, 6x + 2y \geq 8, x \leq 3, y \leq 3, x \geq 0, y \geq 0$$

Q. 25. In how many ways can the letters of the word 'INTERMEDIATE' be arranged if the

(i) no two vowels are together,

(ii) there are always 4 letters between M and N ?

Q. 26. From 50 students taking examinations in Mathematics, Physics and Chemistry, each of the student has passed in at least one of the subject, 37 passed Mathematics, 24 Physics and 43 Chemistry. At most 19 passed Mathematics and Physics, at most 29 Mathematics and Chemistry and at most 20 Physics and Chemistry. What is the largest possible number that could have passed all three examination?
