

FIRST TERM EXAMINATION-2015

CLASS-XI
Subject-Mathematics (Set -1)

M.M=100
T.T= 3 hours

General Instructions:-

- 1 All Questions are compulsory
- 2 The question paper consists of 26 questions divided into 3 sections A,B and C. Section A comprises of 6 questions of one mark each. Section B comprises of 13 questions of 4 marks each and Section C comprises of 7 questions of 6 marks each.
- 3 All questions in Section A are to be answered in one word , one sentence or as per the exact requirement of the question.
- 4 There is no overall choice .However , internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

SECTION A

1. A relation R is defined on the set of integers as $R = \{(x,y):x^2+y^2 = 64\}$. Find its Domain.

2. Simplify $\frac{\cos(2\pi+\theta) \cdot \operatorname{cosec}(2\pi-\theta) \cdot \tan(\pi/2+\theta)}{\sec(\pi/2+\theta) \cdot \cos\theta \cdot \cot(\pi+\theta)}$

3. Simplify $\{i^{17} - (1/i)^{34}\}^2$

4. $\frac{1}{2}(\frac{3}{5}x+4) \geq \frac{1}{3}(x-6)$, Find the solution set.

5. If set $A = \{1\}$. How many elements are there in $P\{P\{P(A)\}\}$.

6. Given set $A = \{1,2,3\}$ and set $B = \{7,9\}$. Let $f = \{(2,9), (3,7)\}$. Is 'f' a function from set A to B? Give Reason.

SECTION B

1. Let $U = \{x \in \mathbb{N} : x \leq 8\}$, $A = \{x \in \mathbb{N} : 5 < x^2 < 50\}$ and $B = \{x \in \mathbb{N} : x \text{ is a prime number less than } 10\}$. Draw a Venn diagram to show the relationship between the given sets. Hence list the elements of the following sets

$A \cap B$ $(A \cup B)'$

8. Find the Domain and Range of $f(x) = \frac{3}{2-x^2}$

OR

Find the Domain and Range of $f(x) = \frac{1}{\sqrt{9-x^2}}$

9. Prove that $\sin^2 A + \sin^2(A+\pi/3) + \sin^2(A-\pi/3) = 3/2$

OR

In a triangle ABC, prove that

$$\sin^2 A/2 + \sin^2 B/2 + \sin^2 C/2 = 1 - 2 \sin A/2 \cdot \sin B/2 \cdot \sin C/2$$

10. Prove that $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

11. Prove that $1^2 + 3^2 + 5^2 + 7^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$

12. Draw the graph of Greatest Integer Function. Also write its Domain and Range

13. Find x and y, for which the complex numbers $-3+ix^2y$ and x^2+y+4i are conjugate of each other. Given $x, y \in \mathbb{R}$

OR

What is the conjugate of $2-i$

$$(1-2i)^2$$

14. Find the square root of $-2 - 2\sqrt{3}i$

OR

Write the following in Polar Form $\frac{1+2i}{1-3i}$

15. Solve the system of inequations $\frac{x+3}{x-2} \leq 2$, $\frac{2x+5}{x+7} \geq 3$

16. A milk of 80% concentration is diluted at home by the seller by adding some water to it so that milk concentration is reduced between 65% to 70%. If 640 litres of milk of 80% concentration is available, how much water has been added? Which value system the seller is lacking?

17. Let A, B and C be three sets intersecting each other. Shade the following sets in a Venn Diagram for the same:

(i) $A' \cap (B \cup C)$ (ii) $A' \cap (C-B)$

18. Prove that $2n+7 < (n+3)^2$ for all $n \in \mathbb{N}$

19. Find the general Solution of $2 \tan x - \cot x + 1 = 0$

$$2 \tan x + 1 = \cot x$$

SECTION C

✓ 20. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B, 10% families buy newspaper C, 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three. Find

- (i) The number of families which buy newspaper A only.
- (ii) The number of families which buy none of A, B and C.
- (iii) The number of families which buy newspaper A but neither B nor C.

✓ 21. If $f(x) = \frac{1+x}{1-x}$, show that $\frac{f(x) \cdot f(x^2)}{1+[f(x)]^2} = \frac{1}{2}$

OR

The function f is defined by $f(x) = \begin{cases} 1-x & x < 0 \\ 1 & x = 0 \\ x+1 & x > 0 \end{cases}$

Find $f(2/3)$, $f(-4/3)$. Also draw the graph of $f(x)$.

✓ 22. Prove that $4\sin \alpha \cdot \sin(60^\circ - \alpha) \cdot \sin(60^\circ + \alpha) = \sin 3\alpha$

✓ 23. Prove that $10^n + 3 \cdot 4^{n+2} + 5$ is divisible by 9 for all natural numbers.

OR

Prove that $n(n+1)(2n+1)$ is divisible by 6 using Principle of Mathematical Induction.

✓ 24. If $|\beta| = 1$, find the value of $\frac{|\beta - \alpha|}{|1 - \bar{\alpha}\beta|}$

✓ 25. Solve the following system of equations graphically and name the vertices of the feasible region along with their coordinates.

$$3x - y \leq 10, \quad x + y \leq 6, \quad x - y \leq 2, \quad x \geq 0, \quad y \geq 0.$$

✓ 26. Prove that $\frac{2 \sin(\alpha - Y) \cdot \cos Y - \sin(\alpha - 2Y)}{2 \sin(\beta - Y) \cdot \cos Y - \sin(\beta - 2Y)} = \frac{\sin \alpha}{\sin \beta}$