# HALF YEARLY EXAMINATION, 2018-19

## MATHEMATICS

**Time : 3 hrs.** **Class - XI** **M.M. : 100**

**Date – 15.09.2017 (Saturday)**

**Name of the student** ____________________________________________ **Section** _____

**General instructions:**

- All the questions are compulsory.
- The question paper is divided into four sections.
  - ✓ Section A contains 4 questions of 1 mark each.
  - ✓ Section B contains 8 questions of 2 marks each.
  - ✓ Section C contains 11 questions of 4 marks each
  - ✓ Section D contains 6 questions of 6 marks each.
- Q. No. 18 & 25 have to be done in graph paper.
- Draw the figures neatly.

## SECTION-A

**Q.1** Write the domain of f(x) = sec x.

**Q.2** Evaluate: $\lim_{x\to 1}\frac{x^{1/3}-1}{x^{1/6}-1}$

**Q.3** Write in roster form: A= $\{a_n : a_1 = a_2 = 1, a_n = a_{n-1} + a_{n-2}, n > 2 \text{ and } n \in N\}$

**Q.4** Find n(P(P(P(A))) if A is the set of real numbers satisfying $x^2 + 1 = 0$

## SECTION - B

**Q.5** Show that if A ⊂ B, then C – B ⊂ C – A.

**Q.6** Let A = {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a , b ∈A, b is exactly divisible by a}.

(i) Write R in roster form (ii) Find the domain of R.

**Q.7** Convert 6 radians into degree measure.

**Q.8** Prove that $sin^2 6x - sin^2 4x = sin10x\ sin2x$

**Q.9** In any triangle ABC ,prove that a (sinB – sinC ) +b (sinC – sinA ) + c (sinA –sinB) = 0

**Q.10** Evaluate: $\lim_{x\to 0}\frac{x(e^x-1)}{1-cosx}$

**Q.11** Differentiate f(x)=$e^x$ from the first principle.

**Q.12** Solve $\frac{x+4}{x-2} > 0$.

## SECTION-C

**Q.13** Each set X contains 5 elements and each Y contains 2 elements and $\bigcup_{r=1}^{20} X_r = S = \bigcup_{r=1}^{n} Y_r$. If each element of S belongs to exactly 10 of the $X_r's$ and to exactly 4 of $Y_r's$, then find the value of n.

**Q.14** Let R be a relation from **N** to **N** defined by $R = \{(a,b) : a,b \in \mathbf{N} \text{ and } a = b^2\}$. Are the following true? Justify your answer in each case.

(i) (*a*,*a*) ∈ R, for all *a* ∈ **N**

(ii) (*a*,*b*) ∈ R, implies (*b*,*a*) ∈ R

(iii) (*a*,*b*) ∈ R, (*b*,*c*) ∈ R implies (*a*,*c*) ∈ R.

**Q.15** Find the domain and range of $f(x) = -\sqrt{8 - x^2}$

**OR**

Let $A = \{9,10,11,12,13\}$ and let $f: A \rightarrow N$ be defined by $f(n) =$ highest prime factor of n. Find the range of $f$.

**Q.16** Find the value of : $sin\ \frac{\pi}{10}$

**OR**

Prove that: $cos^2 x + cos^2\left(x + \frac{\pi}{3}\right) + cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

**Q.17** In a triangle ABC, prove that: $a(\cos C - \cos B) = 2cos^2\frac{A}{2}$ (b – c)

**Q.18** Draw the graph of the function $f(x) = \operatorname{cosec} x$ between the interval $\left[-\frac{\pi}{2}, \frac{3\pi}{2}\right]$.

**Q.19** Prove that : $tan8x - tan6x - tan2x = tan8x.tan6x.tan2x$

**Q.20** A manufacturer has 600litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18% ?

**Q.21** Evaluate: $\lim_{x \to 0} \frac{\tan x - \sin x}{x^3}$

**OR**

Find the value of $a$ if the limit of the function given by: $\begin{cases} \frac{a - ae^{3x}}{x}, if\ x < 0 \\ \frac{sin3x}{3^x - 1}, if\ x > 0 \end{cases}$ exists at $x = 0$.

**Q.22** Find the derivative of $f(x) = \cos(2x + 3)$ from the first principle.

**Q.23** Prove that: $2\cos\frac{\pi}{13}.cos\frac{9\pi}{13} + cos\frac{3\pi}{13} + cos\frac{5\pi}{13} = 0$

## SECTION-D

**Q.24** A school awarded 42 medals in hockey, 18 in basketball and 23 in cricket. If these medals were bagged by a total of 65 students and only 4 students got medals in all the three sports, how many students received medals in exactly two of the three sports?

**Q.25** Solve the following system of inequations graphically.

$6x + 5y \leq 150,\ x + 4y \leq 80, \quad x \leq 15, \quad x \geq 0, y \geq 0.$

**OR**

Solve the following system of inequations graphically.

$x + 2y \leq 10, \quad x + y \geq 1, \quad x - y \leq 0, \quad x \geq 0, y \geq 0$

**Q.26** Find the general solution of the equation sin2x + sin4x + sin6x =0

**Q.27** Differentiate: $\frac{\sqrt{x}.tanx.logx}{cosx}$ with respect to $x$.

**Q.28** Prove that: $sin20.sin40.sin60.sin80 = \frac{3}{16}$

**OR**

If tanx= $\frac{-4}{3}$ and x ∈ 4th quadrant, find the values of $sin\,{}^{x}/_{2}, cos\,{}^{x}/_{2}$ and $tan\,{}^{x}/_{2}$

**Q.29** If $y = \frac{xtanx}{secx+tanx}$, then find $\frac{dy}{dx}$