Session Ending Examination (2015-2016)

Class XI (Mathematics)

Time: 3 Hrs M.M: 100

General Instructions:

a) All the questions are compulsory.

b) The Question Paper consists of 26 Questions divided into three sections A, B and C

c) Section-A comprises of 6 questions of one mark each.

d) Section-B consists of 13 questions of four marks each.

e) Section-C comprises of 7 questions of Six marks each.

f) There is no overall choice. However, an 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.

g) Use of calculator, is not permitted.

Section A

1. If A = {1, 2} and B = {3, 4}, then how many subsets will $A \times B$ have?

2. What connective word is used in the following statement 'ABC is an equilateral triangle, if and only if it is equiangular'.

3. Is 310 a term of the sequence 3, 8, 13, ...?

4. What is the eccentricity of the curve $4x^2 + y^2 = 100$?

5. Write the contra-positive of the statement 'If you are born in India, then you are a citizen of India'.

6. Write the component statements of the compound statement If 2 > 3, then I am the king of India.

Section B

7. A relation R is defined from a set A = {2, 3, 4, 5} to a set B = {3, 6, 7, 10} as follows $'(x, y) \in R \Leftrightarrow x$ divides y.' Express R as a set of ordered pairs and determine the domain and range of R. Also, find R^{-1}.

8. Prove that $\frac{\sin(B-C)}{\cos B\cos C}+\frac{\sin(C-A)}{\cos C\cos A}+\frac{\sin(A-B)}{\cos A\cos B}=0$

9. Prove that $\frac{\cos 2A\cos 3A-\cos 2A\cos 7A+\cos A\cos 10A}{\sin 4A\sin 3A-\sin 2A\sin 5A+\sin 4A\sin 7A}$

Or

Prove that $\cos^4\frac{\pi}{8}+\cos^4\frac{3\pi}{8}+\cos^4\frac{5\pi}{8}+\cos^4\frac{7\pi}{8}=\frac{3}{2}$

10. If z is a complex number such that $|z|=1$, then prove that $\left(\frac{z-1}{z+1}\right)$ is purely imaginary.

11. A man wants to go on a country tour on a cycle to promote Eco-friendly atmosphere. He wants to tour on a cycle and for that he wants to decorate his cycle with three green pieces of cloth. He has cloth of length 91 cm. He wants second length to be 3 cm longer than the shortest and the third length to be twice as long as the shortest. What are the possible length of the shortest cloth, if third piece is to be at least 5 cm larger than the second? What slogan would you like to give to the mission?

12. Find the equation of the line joining the point (3, 5) to the point of intersection of the lines 4x + y - 1 = 0 and 7x - 3y - 35 = 0.

Or

Find the equation of straight line parallel to 2x + 3y + 11 = 0 and the sum of its intercepts on the axes is 15.

13. Solve the equation $\cos\theta+\cos 3\theta-2\cos 2\theta=0$.

14. How many words with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word 'EMPATHY'? Do you agree that empathy is one value which everyone should acquire?

15. Find the equation of a circle whose centre is the point of intersection of the lines 2x - 3y + 4 = 0 and 3x + 4y = 5 passes through the origin.

Or

Find the equation of the ellipse with its foci on Y-axis, eccentricity 3/4, centre at the origin and passing through the point (6, 4).

16. Show that the points A(1, 2, 3), B(-1, -2, -l), C(2, 3, 2) and D(4, 7, 6) are the vertices of a parallelogram ABCD and not of a rectangle.

17. Calculate the mean deviation about mean for the following data

x_i	3	9	17	23	27
f_i	8	10	12	9	5

18. The probability that a person will get an electric contract is $\frac{2}{5}$ and the probability that he will not get plumbing contract is $\frac{4}{7}$. If the probability of getting atleast one contract is $\frac{2}{3}$, then what is the probability that we will get both?

Or

One number is chosen from number 1 to 100. Find the probability that it is divisible by 4 or 6.

19. The mean and standard deviation of 100 observations were calculated as 40 and 5.1 respectively by a student who took by mistake 50 instead of 40 for one observation. What is the correct mean and standard deviation?

Section C

20. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both. Find the number of students

(i) who opted for NCC or NSS.

(ii) who opted neither NCC nor NSS.

(iii) Write the benefit of NCC training.

21. Find the value of $\sin 18°$ and $\cos 18°$.

Or

Prove that $\cos 5A = 16\cos^5 A - 20\cos^3 A + 5\cos A$

22. Using the Principle of Mathematical Induction, prove that

$$1^3 + 2^3 + 3^3 + \ldots + n^3 = \left\{\frac{(n+1)n}{2}\right\}^2 \text{ for all } n \in N$$

23. Solve the system of in-equations graphically.

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

24. Evaluate: $\left\{a^2 + \sqrt{a^2 - 1}\right\}^4 + \left\{a^2 - \sqrt{a^2 - 1}\right\}^4$

25. The sum of n terms of two arithmetic progressions are in the ratio (3 n + 8): (7 n + 15).

Find the ratio of their 12th term.

Or

The pth term of an AP is a and qth term is b. Prove that the sum of its (p + q) terms is

$$\frac{p+q}{2}\left\{a+b+\frac{a-b}{p-q}\right\}$$

26. (i) Evaluate $\lim_{x\to 0}\frac{(a+x)^2\sin(a+x)-a^2\sin a}{x}$

(ii) Differentiate $\frac{\sin x+\cos x}{\sin x-\cos x}$ with respect to x.