Atomic Energy Central School No.4 Rawatbhata
Half Yearly Examination-2015-16
CLASS XI, Sample Paper Mathematics

Time: 3 Hours **Max Marks: 100**

General Instructions 1. All questions are compulsory.

2. The question paper consist of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, section B comprises of 13 questions of four marks each and section comprises of 7 questions of six marks each.

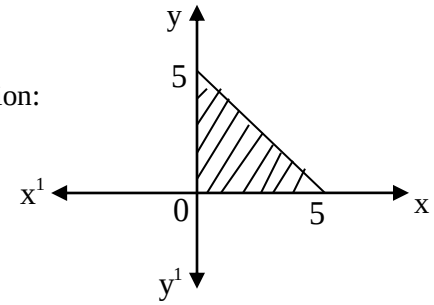
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4. There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six mark each. You have to attempt only one of the alternatives in all such questions.

5. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION-A (1 X 6 = 6)

1. If the set A has 5 elements how many elements does P(A) have?
2. AXB has 6 ordered pairs and three of them are (1,4) (2,6) and (3,6). Find the other three.
3. Evaluate cos (-1710°)
4. If a + ib $= \frac{x+i}{x-i}$, then prove that $a^2 + b^2 = 1$.
5. Write the system of linear inequalities, which represents the shaded region:



6. In how many ways can 5 different balls be disturbed into three boxes?

SECTION-B (13 x 4 = 52)

7. Using properties of set ,prove that A – (B U C) = (A – B) ∩ (A – C)
8. a. Draw the graph of f(x) = [x] . Also write it's domain and range.

   b. Find the domain and range of $\frac{1}{\sqrt{9-x^2}}$ **OR**

   Find the domain and range of the function f(x)= $\frac{x^2}{1+x^2}$
9. Find the domain and range of the function f(x) = $\sqrt{4-x} + \frac{1}{\sqrt{x^2-1}}$.
10. Find the value of

    i) $\sin 15^\circ$ ii) $\tan \frac{13\pi}{12}$
11. Prove that sin x + sin 2x + sin 4x + sin 5x = cos $\frac{x}{2}$ cos $\frac{3x}{2}$ sin 3x..
12. Evaluate $\sin 18^0$.
13. Prove by the principle of induction, that the given statement is true for all natural numbers n.

$$1^2 + 2^2 + 3^2 ..... + n^2 = \frac{n(n+1)(2n+1)}{6}$$

14. Find the modulus and argument of $\frac{1+7i}{(2-i)^2}$ and express it in polar form.

15. Evaluate $\sqrt{5+12\,i}$

16. Solve graphically, the system of linear inequalities: $2x + y < 24$, $x + y < 11$, $2x + 5y \leq 40$, $x \geq 0$, and $y \geq o$.

17. To pass in a subject, one must obtain an average of 33 out of 100 or higher to pass in the subject in five examinations. If a studen's marks in the four subjects are 28, 31 , 40 and 37, then find the minimum marks a student must obtain to pass in the subject.
A student obtained 42 marks in the fifth subject by working hard and trying his best in the examination. Do you think student has passed in the subject? What value system does he possess?

18. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can it be done if the committee consists of
i. exactly 3 girls? ii. at least 3 girls? iii. at the most 3 girls?

OR

A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?

19. The letters of RANDOM are written in all possible orders and these words are written out as in a dictionary. Find the rank of the word RANDOM.

OR

18 mice were placed in two experimental groups and one control group, with all groups equally large. In how many ways can the mice be placed into three groups?

SECTION-C (7 X 6 = 42)

20. In a group of 50 students the number of 50 studying French, English and Sanskrit are as follows –
French – 17, English – 13, Sanskrit -15
French and English 9, English and Sanskrit – 4, Sanskrit and French – 5, all the three languages -3.
Find the number of students who study –
i)French Only ii)French and Sanskrit but not English iii) at least one one of the three languags
iv)None of the three languages v) Exactly two langauges
vi) What is the importance of learning various languages?

21 Find the value of the expression $\cos^4\frac{\pi}{8} + \cos^4\frac{3\pi}{8} + \cos^4\frac{5\pi}{8} + \cos^4\frac{7\pi}{8}$

OR

If $a\cos 2\theta + b\sin 2\theta = c$ has α and β as its roots, then prove that $\tan\alpha + \tan\beta = \frac{2b}{a+c}$.

22. If $x\cos\theta = y\cos\left(\theta + \frac{2\pi}{3}\right) = z\cos\left(\theta + \frac{4\pi}{3}\right)$, then evaluate $xy + yz + zx$.

23. Prove that the given statement is true for all $n \in \mathbf{N}$, using principle of Mathematical Induction

$$\cos(\alpha+\beta) + \cos(\alpha+2\beta) + \cos(\alpha+\beta) + \ldots\ldots + \cos(\alpha+(n-1)\beta) = \frac{\cos\left[\alpha+\left(\frac{n-1}{2}\right)\beta\right]\sin\frac{n\beta}{2}}{\sin\frac{\beta}{2}}$$

24. If $\arg(z-1) = \arg(z+3i)$, then find $x-1 : y$. where $z = x + iy$.

OR

Write the complex number $\frac{i-1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$ in Polar Form.

25. A group of students decided to buy a tape recorder in the range of Rs 170 to Rs 195. At the last moment 2 students backed out of the decision and the remaining students had to pay one Rupee each more than they had planned. What was the price of tape recorder if the students paid equal shares?

26. A bag contains six white marbles and five red marbles. Find the number of ways in which four marbles can be drawn from the bag if (a) they can be of any colour (b) two must be white and two red and (c) they must all be of the same colour.
