

Series.	K I	R II	M III	GIV
---------	-----	------	-------	-----

Roll No.			
----------	--	--	--

Code No. 1/1/2

Candidate must write the Code No. on the title page of the answer book.

- Please check that this question paper contains 3 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 29 questions.
- Please write down the Serial Number of the question before attempting it.

FIRST TERM EXAMINATION 2016-17
SUBJECT CODE - 1102

Time allowed: 3 Hours Maximum Marks: 100

General Instructions:

1. All questions are compulsory.
2. This question paper consists of 29 questions divided into 4 sections A, B, C and D.
3. Question 1- 4 in Section A are very short-answer type questions carrying 1 mark each.
4. Question 5-12 in Section B are short-answer type questions carrying 2 marks each.
5. Question 13-23 in Section C are long-answer-I type questions carrying 4 marks each.
6. Question 24-29 in Section D are long-answer-II type questions carrying 6 marks each.
7. There is no overall choice. However, internal choice has been provided in 3 questions of four marks each and 3 questions of six marks each. You have to attempt only one of the given choices.

SECTION-A



1. If $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{6}\right)$, find the value of $x + y$.
2. Write $\{x \in \mathbb{R} : -1 < x \leq 2\}$ as an interval.
3. Express i^{-35} in the form of $a + ib$.
4. Evaluate $\cos(-1710^\circ)$.

SECTION-B

5. Write the relation $R = \{(x, x^3) : x \text{ is a prime number } < 10\}$ in roster form. Also write its domain and range.
6. Solve the inequalities: $\frac{2x-1}{3} \geq \frac{3x-2}{4} - \frac{2-x}{5}$.

7. Find the multiplicative inverse of $\frac{(i+1)(i+2)}{(i-1)(i-2)}$
8. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$, verify that : $(A \cap B)' = A' \cup B'$
9. Find the number of different signals that can be generated by arranging at least two flags in order (one below the other) on a vertical staff, if five different flags are available.
10. If $f(x) = \frac{1+x}{1-x}$, show that $\frac{f(x) \cdot f(-x)}{1+f(2x)} = \frac{1}{2}(1-2x)$.
11. If ${}^n C_9 = {}^n C_8$, find ${}^n C_{17}$.
12. Prove that : $\sqrt{2 + \sqrt{2 + 2 \cos 4x}} = 2 \cos x$.

SECTION-C

13. Convert the complex number $z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$ in polar form. 
- OR
- Find real θ such that $\frac{3 + 2i \sin \theta}{1 - 2i \sin \theta}$ is purely real.
14. Find the domain and the range of the function $f(x) = \sqrt{x^2 - 4}$. If $g(x) = \sqrt{x + 2}$, find i) $(fg)(x)$ ii) $(f/g)(x)$.
15. A committee of 5 persons is to be constituted from a group of 3 men and 4 women. In how many ways can this be done? The committee has to organize 'Blood Donation Camp', why should one donate blood? 
16. If $\cos x = \frac{-1}{3}$, and x is in quadrant III, find $\sin \frac{x}{2}$ and $\tan \frac{x}{2}$.
17. Solve the equation $2x^2 + 3 = 4x$.
18. Prove that : $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$.
19. Using properties of sets, show that : i) $A = (A \cap B) \cup (A - B)$ ii) $A \cup (B - A) = A \cup B$.
- OR
- Verify the following using Venn Diagram : $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
20. Solve the equation : $\sin x + \cos x = \cos 2x + \sin 2x$.
21. Find r if ${}^5 P_r = 2 {}^6 P_{r-1}$.
- OR
- How many numbers lying between 100 and 1000 can be formed with digits 0, 1, 2, 3, 4, 5, if repetition of digits is not allowed?
22. Solve the following system of inequalities graphically :
 $x + 2y \leq 8, 2x + y \leq 8, x \geq 0, y \geq 0$.
23. Find the square root of $-7 - 24i$.

SECTION-D

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

OR

Prove that : $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$.

25. Prove the following by using the principle of Mathematical Induction for all $n \in \mathbb{N}$.

$$\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \dots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}$$

26. How many 4 letter words with or without meaning can be formed using the letters of the word 'INEFFECTIVE'?

OR

Letters of the word 'MOTHER' are arranged in all possible ways and the words (with or without meaning) so obtained are arranged as in dictionary. What is the position of the word 'MOTHER' in this arrangement.

27. Prove that $x^{2n} - y^{2n}$ is divisible by $x + y$ for all $n \in \mathbb{N}$.

28. In a survey of 25 students , it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry. 5 had taken both Mathematics and Chemistry , 9 had taken both Mathematics and Physics, 4 had taken Physics and Chemistry and 3 had taken all the three subjects . Find the number of students that had : i) only Chemistry ii) Physics and Maths but not Chemistry iii) at least one of the three subjects.

29. A manufacturer has 600 liters of a 12 % solution of acid . How many liters of 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%?

OR

A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid . If we had 640 litres of 8% solution , how many litres of the 2% solution will have to be added.