

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 5470

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Your Roll No.....

Paper Code : A645

Name of the Paper : Mathematical Awareness (In Lieu of Qualifying Course)

Name of the Course : **B.A. (Hons.) Interdisciplinary Concurrent Course**

Duration : 2 Hours

Maximum Marks : 50

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt all the questions as per directions question wise.

1. Do any **two** parts : (2×4)

(a) Answer briefly :

(i) What was Ramanujan's most striking discovery ?

(ii) Who is a sizar ?

(iii) What work is contained in the book XII of Euclid's Elements ?

(iv) What did Riemann introduce in the only single short paper he published on Number theory ?

(b) State whether the following statements are True or false. If false, then give the correct answer :

(i) Elliptic functions may be thought of as complex valued functions defined on a Plane.

(ii) Riemann's theory was a great advance on Hitler's work.

P.T.O.

(iii) Trigonometric functions are real valued functions defined on a Circle, also called Circular functions.

(iv) Euclid flourished around 300 BCE and taught in Alexandria in England.

(c) Fill in the blanks :

(i) Riemann begins where _____ left off, but follows, the same geometric approach.

(ii) In 1846, Riemann matriculated at the _____ in the faculty of Theology.

(iii) Riemann's ideas on complex functions were suggested to him by his studies of _____ .

(iv) In 1849, Riemann returned to Gottingen where he attended the course on _____ .

2. Do any **three** parts :

(3×5)

(a) (i) Express GCD (4928,1771) as a linear combination of 4928 and 1771.

(ii) State the prime Number Theorem as stated by Gauss.

(b) (i) Define magic square of n^{th} order. Construct Albrecht Durer's magic square.

(ii) Give the Binet's formulas for the Fibonacci and Lucas sequences.

(c) Find the least integer remainder when (478,932,649,867) is divided by 7. (Use the divisibility rule of 7).

(d) (i) Find the remainder when : $1! + 2! + 3! + 4! + \dots + 100!$ Is divided by 15. (Use sequences).

- (ii) What is the total number of matches in a tennis tournament with 13 contestants ?

3. Do any **three** parts.

(3×5)

(a) Explain any **two** of the following with examples.

(i) Perspective and Projection

(ii) Types of Fire Altars

(iii) Basic Tilings

(b) (i) State the Four Colour Map Problem.

(ii) Make a comparative study between the Möbius Strip and Klein Bottle.

(c) (i) Find the domain and range of the following functions.

(1) $f(x) = x + 1, x \in [0,1]$

(2) $f(x) = x^2, x \in [-1,1]$

(ii) Write Euler characteristic formula and verify it for tetrahedron and octahedron.

(d) (i) What are the set of symmetries of an equilateral triangle ? Show that it forms a group.

(ii) What is a Chromatic number ? State the chromatic number of a sphere and torus.

4. Do any **three** parts.

(3×4)

(a) Under what conditions would you use the median rather than the mean as a measure of central tendency.

P.T.O.

(b) A die is tossed so that $P(1) = P(2) = P(3) = 1/4$

$$P(4) = P(5) = P(6) = 1/12$$

If $E = \{1, 2\}$, $F = \{2, 3\}$, then show that E and F are independent but not mutually exclusive.

(c) A bag contains 8 white and 4 red balls. Five balls are drawn at random. What is the probability that 2 of them are red and 3 white?

(d) Use the graphical method to solve the following linear programming problem

$$\text{Min } Z = 4x + 6y$$

Subject to the constraints $2x + y = 6$, $x \geq 1$, $y \leq 4$, $x, y \geq 0$.