

This question paper contains 4+1 printed pages]

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S. No. of Question Paper : 8153

Unique Paper Code : 235254

D

Name of the Paper : Mathematical Awareness

Name of the Course : B.A. (Hons.) I

Semester : II

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

All questions are compulsory.

1. Do any *three* parts. Each part carries *four* marks.

(a) Answer in short :

(i) What distinction was Ramanujan awarded on graduating from school ?

(ii) What was Newton's achievement in 1703 ?

(iii) What was the topic of Noether's dissertation ?

(iv) Name the mathematician who wrote the mathematical series named 'Elements'.

P.T.O.

(b) Answer briefly :

(i) Why was Emmy Noether not allowed to teach in Germany until 1900 but was allowed in France since 1861 ?

(ii) What did Riemann introduce in the only single paper he published on Number Theory ?

(iii) Name the mathematician with whom Newton was involved in a dispute over the invention of Calculus.

(iv) Name one work of Euclid on Mathematical astronomy.

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

(i) Euclid is regarded as the pioneer in the invention of calculus.

(ii) Ramanujan passed away at the ripe old age of 82.

(iii) Riemann investigated the mechanism of the human ear.

(iv) Newton's father died three months before Newton was born.

(d) Answer briefly :

(i) Euclid's work was his own, culminating in the construction of five regular solids.

What are these solids known as ?

- (ii) Name the first *two* Cambridge Professors who returned Ramanujan's work.
- (iii) All his life "he" found it difficult to relate to other people. Who is "he" in the above line?
- (iv) Who invited Noether to join them at Gottingen ?

2. Attempt any *three* parts. Each part carries *eight* marks.

- (a) (i) State Vinogradov's Theorem and give examples in support of the theorem. 4
- (ii) State properties of perfect numbers with examples. 4
- (b) (i) State Prime testing method given by Fermat. Is the converse true ? 4
- (ii) Find the value of x if :
- $$1! + 2! + 3! + 4! + \dots + 100! \equiv x \pmod{5}. \quad 4$$
- (c) (i) Define unit fractions and express $\frac{98}{100}$ and $\frac{25}{13}$ as unit fractions. 4
- (ii) Show that the sequence of the ratio of one Fibonacci number to one preceding it converges to the golden ratio. 4
- (d) (i) Explain Durer's magic square. 4
- (ii) Define continued fraction and express $\frac{156}{46}$ as continued fraction. 4

P.T.O.

3. Do any *three* parts. Each part carries *eight* marks.

(a) (i) Define Euler path and Hamiltonian path and give an example of a Euler path which is not a Hamiltonian path. 4

(ii) Sketch the graph of the function $f(x) = x^2$ for $x \geq 0$. What are its domain and range ? 4

(b) (i) Explain how a Snowflake curve is formed ? 4

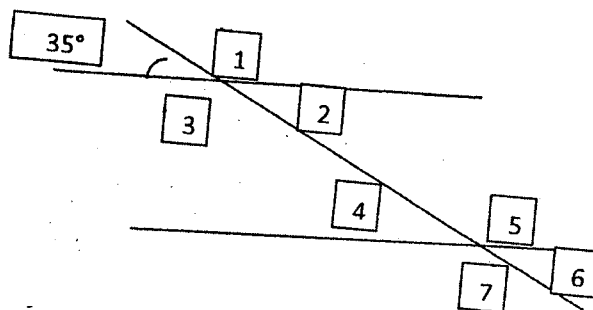
(ii) What are the sets of symmetries of an isosceles triangle ? 4

(c) (i) If $\sin x = (-7)/25$, find the values of the other trigonometric functions. 4

(ii) Explain the difference between Euclidean and non-Euclidean Geometry. 4

(d) (i) Define genus of a surface and give genus of a mobius Strip. 4

(ii) Find the angles in the following figure : 4



4. Do any *three*. Each part carries *five* marks.

(a) Find two numbers whose arithmetic mean is 10 and geometric mean is 8.

(b) A bag contains 6 white and 4 black balls and a second bag contains 4 white and 8 black balls. One of the bags is chosen at random and a draw of 2 balls is made. Find the probability that one is white and other black.

(c) (i) Why range is a crude measure of dispersion ?

(ii) How are standard deviation and variance the same and how are they different ?

(d) Define Optimal solution of a Linear Programming Problem. Solve the following Linear Programming Problem :

$$\text{Maximize : } Z = x_1 - x_2$$

$$\text{Subject to : } 3x_1 + 2x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0.$$