

[This question paper contains 6 printed pages.]

5205

Your Roll No. ....

Concurrent Courses for B.A. (Hons.) Prog. B

MATHEMATICAL AWARENESS

(Qualifying)

Time : 2 Hours

Maximum Marks : 50

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

*Attempt all questions as per  
directions questionwise.*

UNIT - I

1. Do any two parts :

(a) (i) Isaac Newton entered Trinity College, Cambridge in 1661 as a sizar. How did the sizars earn their keep ?

(ii) Which book was at the core of mathematical education for about 2000 years in the western world ?

(iii) Who said the following in a faculty meeting :  
"After all, we are a university, not a bathing establishment", to secure Emmy Noether an academic position in Gottingen ?

P.T.O.

- (iv) Name the broad area in which Riemann wrote this doctoral thesis.
- (v) In 1918 Ramanujan was elected to two prestigious fellowships. Name any one of them.
- (vi) In which book did Newton develop the idea of gravitation based on the inverse square law? (6)
- (b) (i) Name two mathematicians who influenced Riemann's work the most.
- (ii) In 1693 Newton left Cambridge. What was his new assignment.
- (iii) Where was Srinivas Ramanujan born?
- (iv) In 1908 Emmy Noether completed her dissertation under a colleague of her father. Who was he?
- (v) To whom was Weyl referring when he wrote: "And of all I have known, she was certainly one of the happiest"?
- (vi) Name the goddess Ramanujan himself attributed his excellent powers to. (6)
- (c) State which of the following statements are true or false. If false, give the correct answer.

- (i) Euclids geometry mainly deals with the geometry of triangles and circles.
  - (ii) Newton calculated the curve a planet would describe under the inverse square law. It was a parabola.
  - (iii) Ramanujan received all his early education in Kumbhakonam.
  - (iv) Riemann's thesis on trigonometric series presented to the university in 1853 was published only after his death.
  - (v) The main problem faced by Ramanujan on his arrival at London was the difficulty in getting proper food.
  - (vi) Newton discovered the series for  $\log (1+x)$ .
- (6)

## UNIT - II

2. Do any three parts :

- (a) (i) What is casting out nines. Use it to check if the following computation is probably correct or definitely wrong :

$$35897 + 750971 + 908085 = 1684953.$$

- (ii) Determine if the number 18 is deficient or abundant.

(5)

P.T.O.

(b) (i) Verify that 1184 and 1210 is an amicable pair.

(ii) Determine the rational number determined by the following continued fraction :

$$[3; 4, 1, 4, 2]. \quad (5)$$

(c) (i) Using Fundamental Theorem of Arithmetic find the number of zeroes trailing  $224!$

OR

Use Legendre's form of approximation for finding the number of primes less than or equal to  $10^3$ .

(ii) Show that 341 is a pseudoprime. (5)

(d) Mark True or False, where  $a, b, c$  and  $d$  are arbitrary integers,  $m$  is a positive integer and  $p$  is a prime. If the statement is false then give a counter example to disprove the statement,

(i) If  $a^2 \equiv b^2 \pmod{m}$  then  $a \equiv b \pmod{m}$ .

(ii) If  $a \equiv b \pmod{m}$  and  $c \equiv d \pmod{m}$  then  $(a + c) \equiv (b + d) \pmod{m}$ .

(iii) If  $a \not\equiv 0 \pmod{m}$  and  $b \not\equiv 0 \pmod{m}$  then  $ab \not\equiv 0 \pmod{m}$ .

(iv) If  $ac \equiv bc \pmod{p}$  and  $p \nmid c$  then  $a \equiv b \pmod{p}$ . (5)

## UNIT - III

3. Do any **three** parts :

(a) Write shorts on any **four** of the following :

- (i) Ercher's Art
- (ii) Basic Tilings
- (iii) Fire Altars
- (iv) Four Color Map Problem
- (v) Genus (5)

(b) (i) Give the set of symmetries of an isosceles triangle. Show that it forms a group.

(ii) Verify Euler's formula for the following regular polyhedra

- (i) Cube (ii) Dodecahedron (iii) Icosahedron (5)

(c) (i) Explain the difference in the paintings before and after the development of perspective geometry.

(ii) Explain how the 'Rabbit Problem' leads to the introduction of Fibonacci numbers. (5)

(d) (i) Find the domain and range of the following functions

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

(ii)  $f(x) = x - 1, x \in [3, 4]$

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

(ii) Write short notes on any two of the following :

- (i) Möbius Strip
  - (ii) Königsberg Bridge Problem
  - (iii) Coastline fractal
- (5)

### UNIT - IV

4. Do any two parts :

(a) Six cards are drawn from an ordinary pack of 52 cards. What is the probability that 3 will be black and 3 red ?

(4)

(b) Draw a graph of the following problem, show the feasible region and solve

$$\text{Max } Z = 2X + Y$$

Subject to the constraints

$$5X + 10Y \leq 50$$

$$X + Y \geq 1$$

$$X - Y \leq 0$$

$$X \geq 0$$

$$Y \geq 0$$

(c) Calculate the first and the third quartile of the following data :

Values	: 5-6	6-7	7-8	8-9	9-10	10-11
Frequencies:	5	8	12	15	6	2

(4)