

This question paper contains 8 printed pages]

Your Roll No. ....

471

**B.A. (H)/Concurrent Course      G**

Paper Code : A-531

**MATHEMATICAL AWARENESS**

(Interdisciplinary)

*Time : 2 Hours*

*Maximum Marks : 50*

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

*Note :—* The maximum marks printed on the question paper are applicable for the candidates registered with the School of Open Learning for the B.A.(Hons.). These marks will, however, be scaled down proportionately in respect of the students of regular colleges, at the time of posting of awards for compilation of result.

Attempt *All* the questions as per

directed questionwise.

P.T.O.

## UNIT-I

I. Do any *two* parts :

- (a) (i) Who are the *two* mathematicians with whom Ramanujan collaborated in Cambridge ?
- (ii) Give the result about perfect number that was established by Euclid.
- (iii) State Newton's 'Inverse Square Law'.
- (iv) In which year did Riemann present his doctoral thesis and what was the title of the thesis ?
- (b) (i) What was the name given to the geometry created by Euclid ?
- (ii) What distinction was Ramanujan awarded on graduating from school ?

(iii) What is the full name of Ramanujan ? Name the disease from which Ramanujan was suffering.

(iv) What did Weyl write about Noether ? 4

(c) State whether the following statements are True or False.

If false, then give the *correct* answer : 4

(i) The doctoral thesis of Riemann deal with the Number theory.

(ii) Emmy Noether's main contribution was in the field of graph theory.

(iii) Euclid proved that the fifth Fermat number cannot be factorized.

(iv) Ramanujan was born on Christmas Day in 1887.

P.T.O.

## UNIT-2

2. Do any *three* parts :

(a) (i) State the Prime Number Theorem as conjectured by Legendre.

(ii) If

$$a \equiv b \pmod{m}$$

then

$$a^n \equiv b^n \pmod{m}.$$

Using this show that

$$2^{2^n} \equiv 1 \pmod{3}.$$

3+2

(b) (i) Write  $\frac{6237}{2520}$  as a continued fraction.

(ii) The student welfare committee has 2 faculty, 2 administration members and 5 students on it. In how many ways can a sub-committee of 1 faculty, 1 administrative member and 2 students be formed ?

(iii) What is a RSA System ? 2+2+1

(c) Briefly explain the following :

(i) Algebraic numbers

(ii) Transcendental numbers

(iii) Mersenne numbers

(iv) Fractions

(v) Irrational numbers. 5

(d) (i) Why was Fermat's last theorem also called an impossible theorem ?

(ii) Find the integer  $x$  such that  $(16)^{53} \equiv x \pmod{17}$ .

(iii) State the Euclidean Algorithm. Using the above Algorithm, find greatest common divisor of 6237 and 2520. 1+1+3

P.T.O.

## UNIT-3

3. Do any *three* parts :

(a) Draw the graphs of the following functions and indicate where the function is increasing or decreasing :

(i)  $F(x) = |x + 1|$

(ii)  $F(x) = \sqrt{1 - x^2}$  .

Also, find their domain and range. 6

(b) Briefly explain any *four* of the following : 6

(i) Mobius Strip

(ii) Klein Bottle

(iii) Basic Tillings

(iv) Fire Altars

(v) Platonic solids.

(c) (i) Verify Euler's formula for the five regular polyhedral.

- (ii) Explain how the snow flake curve is formed. What can be said about its area and perimeter ? 3+3
- (d) (i) Give the set of symmetries of an equilateral triangle.
- (ii) Briefly explain Königsberg bridge problem.
- (iii) Find the number of different 8-letter arrangements that can be made from letters of the word DAUGHTER so that all vowels occur together.

2+2+2

**UNIT-4**4. Do any *two* parts :

- (a) The AM and GM of two numbers are 15 and 12 respectively. Find Harmonic mean of two numbers. 4.5
- (b) A die is loaded so that :

$$P(1) = P(2) = P(3) = \frac{1}{4}$$

$$P(4) = P(5) = P(6) = \frac{1}{12}$$

P.T.O.

If

$$E = \{1, 2\}, F = \{2, 3\}.$$

Show that E and F are independent but not mutually exclusive. 4.5

(c) Use graphical method to solve the following LP problem : 4.5

$$\text{Min. } Z = 2x + 5y$$

Subject to

$$x + 3y \geq 21$$

$$4x + y \geq 24$$

$$x + y \geq 9$$

$$x, y \geq 0.$$