

This question paper contains 7 printed pages.]

Your Roll No.

710

Concurrent Courses for

A

B.A. (Hons.) Prog.

(Qualifying)

MATHEMATICAL AWARENESS

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** questions as per
directed 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) He could demonstrate with ease all the propositions of the six books of Euclid after he became a member of the US congress. Who was he ?
- (iii) Name the broad area in which Riemann wrote his doctoral thesis in 1851 ?
- (iv) To whom was Weyl referring when he said "And of all I have known she was certainly one of the happiest" ?
- (v) In 1918, Ramanujan was elected to two prestigious fellowships. Name any one of them.
- (vi) A famous comet is named after the main mentor of Newton. Who was this astronomer ?
- (b) (i) Riemann succeeded Dirichlet as a full professor at the Georgia Augusta. In which year ?
- (ii) Newton calculated the curve a planet would describe under the inverse square law. What is this curve known as ?

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- (iii) Where was Srinivas Ramanujan born ?
 - (iv) In which college in America did Emmy Noether get a temporary position in 1933 ?
 - (v) Euclid taught in a university situated in a city founded by Alexander the Great in 322 BCE. Name the city.
 - (vi) Name two mathematicians who influenced Riemann's work the most ? 4
- (c) State whether the following statements are true or false. If false, give the correct answer.
- (i) Emmy Noether mainly worked in complex analysis.
 - (ii) Some of the most sophisticated parts of Elements by Euclid were due to earlier mathematicians.
 - (iii) Newton preferred Descartes geometry to that of Euclid's.
 - (iv) Ramanujan received all his early education in his mother's hometown Erode.
 - (v) Academic honours were conferred on Riemann by the Royal Society of London.
 - (vi) Newton died in Moscow. 4

UNIT – II

2. Do any **three parts** :

(a) How many 3^{rd} order magic squares can be obtained, starting from a given 3^{rd} order magic square with numbers 1 to 9. Illustrate. **5**

(b) (i) Using Binet's formulas, prove
 $F_{n+2} - F_{n-2} = L_n$ where F_n and L_n denote the n^{th} term of Fibonacci and Lucas sequences respectively.

OR

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

(ii) Use casting out Nines method to check if the following computation is probably correct or definitely wrong :

$$2076 \times 1076 = 223766. \quad \mathbf{5}$$

(c) Mark True or False. If false then correct the statement.

(i) $9^{100} \equiv 9 \pmod{10}$

(ii) $12 \equiv (-8) \pmod{5}$

(iii) $10^{2001} \equiv (-1) \pmod{11}$

(iv) $2^{35} \equiv 3 \pmod{7} \quad \mathbf{5}$

- (d) (i) Using Fundamental theorem of Arithmetic find the number of zeroes trailing $200!$.

OR

Write $\frac{116}{367}$ as a continued fraction.

- (ii) A licensing agency uses a system of any two letters from the English alphabet, followed by three digits (1 through 9), followed by any one letter from the English alphabet. Find the greatest possible number of licenses that can be issued using this system.

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UNIT – III

3. Do any **three** parts :

- (a) (i) Verify which of the following are even or odd functions (via graphs) :

- (1) $\cos x$
- (2) $\sin x$
- (3) $\tan x$
- (4) $\sec x$

- (ii) Show that the area of the snowflake curve is finite.

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- (b) What is the Königsberg Bridge problem ? Give the graphical representation of the problem by Euler, explaining why a solution to the problem did not exist ?

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- (c) (i) Define Reflection symmetry and Rotational symmetry. What are the reflection and rotational symmetries of a square and an isosceles triangle. Explain their symmetry groups.
- (ii) Name any four types of Fire Altars used in Ancient India. 5
- (d) Briefly explain any **four** of the following :
- (i) Four Color Map Problem
- (ii) Möbius Strip
- (iii) Basic Tilings
- (iv) Golden Ratio
- (v) Perspective and Projection 5

UNIT – IV

4. Do any **two** parts :

- (a) Six cards are drawn at random from a ordinary pack of 52 cards. What is the probability that 3 will be red and 3 black ? 6

- (b) Draw a graph of the following problem, show the feasible region and solve : 6

$$\text{Max } Z = 5x + 3y$$

Subject to the constraints

$$3x + 5y \leq 15$$

$$5x + 2y \leq 10$$

$$x \geq 0$$

$$y \geq 0$$

(c) Calculate the Standard Deviation from the following data :

| | | | | | | | | | |
|-------------------|-----|-----|-----|----|----|----|----|----|----|
| Marks (above) : | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| No. of Students : | 150 | 140 | 100 | 80 | 80 | 70 | 30 | 14 | 0 |

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