

This question paper contains 7 printed pages.]

Your Roll No.

711

CONCURRENT COURSES FOR A
B.A. (Hons.) Programme
(Interdisciplinary)
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) Euclid taught in a university in Africa around 300 BCE. Which city was this university situated in ?
- (ii) In 1693 Newton left Cambridge. Which position did he occupy then ?
- (iii) Riemann succeeded Dirichet as a full professor at the Georgia Augusta. In which year ?
- (iv) Which political group arrested the growth of Emmy Noether's teaching career at Göttingen ?
- (v) One professor of mathematics at the Presidency College at Madras provided financial support to Ramanujan for a while around 1910. Who was he ?
- (vi) In which book did Newton develop the idea of gravitation based on the inverse square law ?
- (b) (i) Which American president mastered six books of Euclid ?
- (ii) Newton had a dispute with a French mathematician over the invension of the calculus. Name the French mathematician.

4

- (iii) When was Srinivas Ramanujan born ?
 - (iv) Around 1855 how did Dirichet help Riemann to earn his living ?
 - (v) In which college in America did Emmy Noether find a temporary position in 1933 ?
 - (vi) Other than Hardy name another English mathematician who came in contact with Ramanujan ?
- 4

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

- (i) Newton calculated the curve a planet would describe under the inverse square law. It was a parabola.
 - (ii) Euclids 'Elements' mostly deals with probability theory.
 - (iii) All his life Riemann found it difficult to relate to people.
 - (iv) Srinivas Ramanujan died in London.
 - (v) Newton's father was a professor at Cambridge.
 - (vi) The final years of Riemann were spent in Italy.
- 4

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 :
 $7958036 - 2309859 = 5948177$.
- (ii) Verify that 2620 and 2924 form an amicable pair. 5
- (b) (i) Using Fundamental Theorem of Arithmetic find the number of zeroes trailing 220 !

OR

The five lamps of an optical paging system can be switched to show a steady light, a flashing light, or no light. When all the lights are off, nobody is being paged. How many people can be individually paged by the system.

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

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

- (i) If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$
then $ac \equiv bd \pmod{m}$
- (ii) If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$
then $a + c \equiv b + d \pmod{m}$
- (iii) If $ac \equiv bc \pmod{m}$ then $a \equiv b \pmod{m}$
- (iv) If $a^2 \equiv b^2 \pmod{m}$ then $a \equiv b \pmod{m}$. 5
- (d) (i) Use Legendre's form of approximation for finding the number of primes less than or equal to 10^3 .

OR

Using Binet's formulas prove

$L_{n-1} + L_{n+1} = 5 F_n$ where L_n and F_n denote the n^{th} term of Lucas and Fibonacci sequences respectively.

- (ii) Using Euclidean Algorithm find $\text{gcd}(56, 172)$. 5

UNIT – III

3. Do any **three** parts :

- (a) (i) Explain how the snow flake curve is formed. What can be said about its perimeter and area ?
- (ii) Sketch the graph of the function $f(x) = |x + 1|$ in the interval $[-3, 1]$. State in which parts of the interval is the function increasing or decreasing. 5

- (b) (i) Write short notes on Möbius Strip and Klein Bottle emphasizing on their similarities and differences.
- (ii) Explain the relation between the golden ratio and the golden rectangle. Give examples of where they have been extensively used. 5
- (c) (i) Verify Euler's formula for the five regular polyhedra.
- (ii) Explain any two of the following with examples :
- (1) Symmetry groups
 - (2) Chromatic number
 - (3) Genus 5
- (d) (i) Draw the graphs of the following functions and indicate where the function is increasing and decreasing :
- (1) $f(x) = |x|$ in $[-1, 1]$
 - (2) $f(x) = \sqrt{1 - x^2}$
- Also find their domain and range.
- (ii) State the Four Color Map problem. 5

UNIT - IV

4. Do any **two** parts :

(a) What are the chances that a

(i) non-leap year, (ii) leap year
should have fifty three Sundays. **6**

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

$$\text{Max } Z = 2x + 3y$$

subject to the constraints

$$x + 2y \leq 10$$

$$2x + y \leq 14$$

$$x \geq 0$$

$$y \geq 0$$

6

(c) Calculate Standard Deviation from the
following data :

Value : 140 145 150 155 160 165 170 175

Frequency : 1 4 15 30 36 24 8 2

6