

This question paper contains 7 printed pages.]

Your Roll No.

5206

CONCURRENT COURSES FOR B

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.

1. Do any two parts :

(a) Answer the following :

- (i) Differential Geometry grew from Newton's which idea ?
- (ii) What did Riemann introduce in the only single short paper he published on number theory and what was its importance ?
- (iii) In which year Noether was awarded Ph.D., what was the title of her dissertation ?
- (iv) Give the name of the paper of Ramanujan which was published in the journal of the Indian Mathematical Society around 1910. 4

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

- (i) In the early 1690's Newton worked on classification of Cubic curves.
- (ii) Ramanujan worked with integration but had only the vaguest idea of complex analysis.
- (iii) Riemann's theory was a great advance on Cauchy's work.

- (iv) Principia contained the theory of algebra based on Newton's inverse square law of 1665.

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(c) Fill in the blanks :

- (i) Emmy Noether's revolutionary 1921 paper on _____ where the concept of _____ originated is arguably the finest work.

- (ii) Riemann introduced an integral called _____ in _____.

- (iii) The theory of Regular Polyhedra is due to _____ contained in Book _____ of Euclid's Elements.

- (iv) In 1918, Ramanujan got elected to the fellowship of _____ and _____.

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2. Do any **three** parts :

(a) Explain the following :

- (i) Fermat Numbers
(ii) Mersenne Primes
(iii) Amicable Numbers
(iv) Diagonal Latin Square
(v) Twin Primes

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- (b) (i) Find the remainder when :
 $1! + 2! + 3! + 4! + \dots + 100!$ is
divisible by 15. (Use congruences)
- (ii) Define algebraic and transcendental numbers. Are transcendental numbers rational, irrational or both? 3 + 2
- (c) (i) State Prime Testing Method given by Fermat. Is the converse true? Justify your answer.
- (ii) Using Euclidean Algorithm calculate $\gcd(1259, 353)$ and find integers x and y satisfying.

$$\gcd(1259, 353) = 1259x + 353y. \quad 2 + 3$$
- (d) (i) In how many ways 5 Indian and 4 Englishmen can be seated at a round table if no two Englishmen sit together.
- (ii) Define primitive Pythagorean Triples. State the Pythagorean number theorem.
- (iii) What is the ratio of one Fibonacci number to the one preceding it. 2 + 2 + 1

3. Do any **three** parts :

- (a) (i) Given a line segment AB of length 'a', construct a line segment such that the point B divides that the line segment in Golden section. **3**
- (ii) Define Golden Triangle and Golden Rectangle. **2**
- (b) (i) Define Genus of a surface. Give Genus of a sphere, an anchor ring, a Möbius strip and a Klein Bottle.

OR

- Write a short note on Koch Snowflake Curve. Show that it has infinite perimeter. **3**
- (ii) Briefly explain Königsberg Bridge Problem. **2**
- (c) (i) Make a multiplication table of the rotational and reflection symmetries of an equilateral triangle.

OR

- Construct 3-regular graph of 10 vertices. **3**
- (ii) Name any two types of Kamya Agnis. Also write the objective behind their construction. **2**

- (d) (i) Find the domain and the range of the following function :

$$f(x) = 2 - \sqrt{(1-x)}$$

Hence, find its maximum and minimum value in its domain. 3

- (ii) What are Platonic solids ? Naming all its different types. 2

4. Do any **three** parts :

- (a) Use graphical method to solve the LP problem :

$$\text{Min } Z = 4x + 3y$$

$$\text{w.r.t. } x + y \leq 5$$

$$-x + y \leq 7$$

$$x + 2y \geq 10$$

$$x, y \geq 0$$

Also indicate the feasible region. 4

- (b) State the addition theorem of probability. A bag contains 8 white and 4 red balls. Five balls are drawn at a random. What is the probability that 2 of them are red and 3 white ? 4

- (c) In a moderately symmetrical distribution, the mode and mean are 32.1 and 35.4 respectively. Find out the value of the median. 4
- (d) Explain the meaning of skewness. What are the objectives of measuring it ? 4
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