

[This question paper contains 6 printed pages.]

5259

Your Roll No. ....

J

**Concurrent Courses for B.A. (Hons.) Programme**

(Credit Course)

**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 in one or two words.

(i) What is the full name of Ramanujan ?

P.T.O.

- (ii) Where did Noether give her weekly Lectures on algebra ?
  - (iii) When did Newton become the president of the Royal society ?
  - (iv) What was the title given to Euclid due to his work in the field of geometry ?
  - (v) Where was Riemann born ?
  - (vi) When was Newton born ? (4)
- (b) State whether the following statements are True or False. If false, then give the correct answer :
- (i) Emmy Noether's main contribution was in the field of graph theory.
  - (ii) Newton was born on Christmas day in the year 1642.
  - (iii) Riemann introduced a type of integral.
  - (iv) Euclid is regarded pioneer in the invention of calculus.
  - (v) The symbol 'e' was first used by Euclid.
  - (vi) Ramanujan's area of research was complex Analysis. (4)

- (c) (i) State Newton's inverse square law.
- (ii) What was the topic of Noether's dissertation?
- (iii) Name Ramanujan's first paper. When was it published? (4)

2. Do any **three** parts :

- (a) (i) Using Division Algorithm show that the set of three positive integers  $\{15, 42, 70\}$  are coprime but are not coprime when taken in pairs. (3½)

OR

Express  $\frac{41}{221}$  as a continued fraction. (3½)

- (ii) Give an example to show that it is not necessarily true that  $\gcd(a, b, c) \times \text{lcm}(a, b, c) = abc$ . (2)
- (b) (i) Define algebraic and transcendental numbers. Are transcendental numbers rational, irrational or both. (3½)
- (ii) If  $a \equiv b \pmod{m}$  then  $a^n \equiv b^n \pmod{m}$  and also  $a + c \equiv b + c \pmod{m}$ . Using this show that

$$2^{2^n} + 5 \equiv 0 \pmod{3}. \quad (2)$$

P.T.O.

(c) Define even and odd permutations. Find which of the following are even permutations.

(i)  $(1\ 2)(1\ 4)(1\ 5\ 3)$

(ii)  $(1\ 3\ 2\ 4)(5\ 6)(7\ 8\ 9)$  (3½)

OR

12 men and 14 women apply for a total of 8 assignments in a research project that will take place in a secluded underground site placing extreme demands on congeniality and co-operation between all participants. Find the number of possible combinations of the work crew if

(i) there is no stipulated men-women quota

(ii) as many a men as women should be employed. (2)

(d) How many third order magic squares can be obtained from a given third order magic square formed with numbers 1 to 9. Illustrate. (5½)

3. Do any three parts :

(a) Briefly explain any four of the following :

(i) Perspective and Projection

- (ii) Möbius Strip
  - (iii) Klein Bottle
  - (iv) Four Color Map Problem
  - (v) Basic Tilings (5½)
- (b) (i) Verify Euler's formula for the five regular polyhedra. (3½)
- (ii) Define the golden ratio and the golden rectangle. Give their significance during ancient Greek period. (2)
- (c) Define Reflection Symmetry and Rotational Symmetry. What are the reflection and rotational symmetries of a square and an isosceles triangle. Explain their symmetry groups. (5½)
- (d) (i) Define the snowflake curve. What can you say about its perimeter and area. (3)
- (ii) Draw the graph of the function  $f(x) = |x|$  in the interval  $[-1, 1]$ . State in which parts of the interval is the function increasing or decreasing. Give its points of maxima or minima. (2½)

4. Do any two parts :

(a) The sum of deviations of a certain number of observations measured from 4 is 72 and the sum of observations of the same value from 7 is -3. Find the number of observation and their mean. (4½)

(b) A bag contains 8 white and 4 red balls. Five balls are drawn at random. What is the probability that 2 of them are red and 3 white. (4½)

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

$$\text{Max } P = 2X + 5Y$$

$$\text{w.r.t. } X + 3Y \leq 21$$

$$4X + Y \leq 24$$

$$X + Y \leq 9$$

$$X, Y \geq 0$$

Also shade the feasible region. (4½)