5204   B

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.)

Attempt all questions as per

directed questionwise.

UNIT – I

1. Do any **two** parts :

    (a) (i)   Newton calculated the curve a planet would describe under the inverse square law. What is this curve called ?

         (ii) Which American President mastered six books of Euclid ?

        (iii) A branch of algebra is known after Emmy Noether. What is it called ?

(iv) In 1912, where did Ramanujan first find a job ?

(v) Name two mathematicians who influenced Riemann's work the most.

(vi) In 1669 Newton was offered a chair (professorship) at Trinity College. Name the chair. 6

(b) (i) Which book was Bertrand Russell referring to when he wrote : "I had not imagined there is anything so delicious in this world" ?

(ii) Other than Hardy, name another English Mathematician who came in contact with Ramanujan.

(iii) After his death, where was Newton burried ?

(iv) In which college in America did Emmy Noether find a temporary position in 1933 ?

(v) A professor of mathematics at the Presidency College, Madras provided financial support to Ramanujan for a while around 1910. Who was he ?

(vi) In 1908 Emmy Noether completed her dissertation under the supervision of a colleague of her father. What was the name of this professor ? 6

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

(i) Principia Mathematica was published after the death of its author Isaac Newton.

(ii) Euclids 'Elements' mainly deals with probability theory.

(iii) Ramanujan published his first research paper in the Indian Journal of Mathematics.

(iv) Newton discovered the series for log $(1 + x)$.

(v) After returning from America, Emmy Noether died in Berlin.

(vi) Ramanujan used to eat out at a South Indian hotel in London. 6

UNIT – II

2. Do any **three** parts :

(a) (i) Using Fundamental theorem of Arithmetic, find the number of zeroes trailing 180 !

OR

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.

(ii) Show that 341 is a pseudo-prime. 5

(b) (i) What is Casting Out Nines ? Use casting out nines to check if the sum of the numbers 4569, 24387 and 49508 is 79464.

(ii) Define perfect numbers. Write at least three characteristic features of perfect numbers. : 5.

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

(i) If $a^2 \equiv b^2 \pmod{m}$ then $a \equiv b \pmod{m}$

(ii) If $ab \equiv 0 \pmod{m}$ then $a \equiv 0 \pmod{m}$ and $b \equiv 0 \pmod{m}$

(iii) If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$, then $ac \equiv bd \pmod{m}$.

(iv) If $a + c \equiv b + c \pmod{m}$, then $a \equiv b \pmod{m}$. 5

(d) (i) Use Legendre form of approximation for finding the number of primes less than or equal to 10^4.

OR

Using Binet's formulas, prove

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

(ii) Verify the two Goldbach's conjectures for $n = 48$. 5

UNIT – III

3. Do any **three** parts :

   (a) (i) Briefly explain any **two** of the following :

   (1) Königsberg Bridge Problem
   (2) Fire Altars
   (3) Coastline fractals

   (ii) Draw the graph of the function $f(x) = \sin x$ in the interval $[0, 2\pi]$. Indicate its points of maxima and minima.   5

   (b) (i) Define regular polyhedra, naming all its different types. Show how Euler's formula for the polyhedra works for them.

   (ii) State the Four Color Map Problem. What is a chromatic number ? Give chromatic numbers for a sphere and a torus.   5

   (c) (i) Define reflection and rotational symmetries. What are the reflection and rotational symmetries of an equilateral triangle ?

   (ii) Make a comparative study between the Möbius Strip and Klein Bottle.   5

   (d) (i) Write short notes on any **three** of the following :

   (1) Fire Altars
   (2) Basic Tilings
   (3) Genus
   (4) Golden Ratio

(ii) State which of the following are functions and which are non-functions. Give reasons.

(1) $x = y^2$ where y is the independent variable and x is the dependent variable.

(2) $x = y^2$ where y is the dependent variable and x is the independent variable.

(3) $x = |y|$ where x is the dependent variable and y is the independent variable.

(4) $x = |y|$ where x is the independent variable and y is the dependent variable.   5

4. Do any **two** parts.

(a) An integer is chosen at random from the first two hundred positive integers. What is the probability that the integer chosen is divisible by 6 or 8 ?   4

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

Min $z = x - 7y$

Subject to the constraints

$$x + y \leq 8$$
$$x + y \geq 4$$
$$0 \leq x \leq 5$$
$$0 \leq y \leq 5$$ 4

(c) Calculate the Standard Deviation of wage earner's daily earnings :

Week	:	1	2	3	4	5	6	7	8	9	10
Earnings	:	54	62	63	65	68	71	73	78	82	84	4