

**UNIVERSITY OF COLOMBO - SRI LANKA**  
**FACULTY OF ARTS**  
**FIRST YEAR EXAMINATION IN ARTS (SEMESTER II) – 2018/2019**  
**FND 1207 – BASIC MATHEMATICS**  
**(Time: Two Hours)**  
**Answer only four (04) questions**  
**No. of questions: 08**  
**No. of pages: 04**  
**(Each question carries equal marks)**

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- 1.) i.) Give an example for an irrational number between 99 and 100.  
(Note that  $\frac{1}{\sqrt{2}}$  is an irrational number between 0 and 1)
- ii.) Is the sum of any two irrational numbers always irrational? Explain.
- iii.) Rationalize the denominator.
- a.)  $\frac{1}{1+\sqrt{2}}$
- b.)  $\frac{1}{\sqrt{5}-\sqrt{3}}$
- 2.) i.) Simplify the following expressions using your knowledge on indices.
- a.)  $\frac{2^{\frac{1}{2}} \times 2^{\frac{1}{3}} \times 2^{\frac{1}{4}}}{2^{\frac{1}{3}} \times 2^{\frac{1}{4}}}$
- b.)  $\frac{(2^{\frac{1}{2}} \times 2^{\frac{1}{3}} \times 2^{\frac{1}{6}})^2}{(2^2 \times 2^{\frac{1}{2}})^3}$
- ii.) Solve the following equations.
- a.)  $(2^x \times 2^{\frac{1}{2}})^2 = 2^5$
- b.)  $(2^x \times 2^{x+1} \times 2^{x+3})^{\frac{1}{2}} = 2^{10}$
- iii.) Calculate the value of E.
- $$E = \frac{(3^{\frac{1}{2}} \times 3^{x+1} \times 3^{\frac{3}{2}})^2}{(3^x \times 3)^2}$$

3.) i.) Evaluate.

$$\frac{(\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}) + (1\frac{1}{2} + 2\frac{2}{3} + 3\frac{3}{4} + 4\frac{4}{5})}{15}$$

ii.) Factorize the following expressions.

a.)  $x^2yz^2 + x^3yz + xy^3z - xyz^3$

b.)  $x^2y - 6xyz + 9yz^2$

iii.) Find the value of  $\frac{x^2yz^2 + x^3yz + xy^3z - xyz^3}{x+2y+z}$  when  $x = 3, y = 4$  and  $z = 5$

iv.) Using your knowledge on factors calculate the value of  $707 \times 693$ .

4.) i.) Prove that for any positive numbers  $a, b$  :

a.)  $\log_{10}(a \times b) = \log_{10}a + \log_{10}b$

b.)  $\log_{10}(a^b) = b \times \log_{10}a$

ii.) Given that  $\log_{10}(8) = 0.9$  and  $\log_{10}(3) = 0.48$

a.) Find the value of  $\log_{10}(2)$  and  $\log_{10}(5)$ .

b.) Find the value of  $\log_{10}(\frac{324}{125})$ .

c.) Using part ( b.) find the value of  $\log_{10}(\frac{3.24}{125})$ .

5.) i.) A, B and C are three subsets of the universal set  $\xi$  such that A is a subset of B and A intersects C.

a.) Represent these three sets in a Venn diagram.

b.) Denote  $(A \cap B) \cap C$

ii.) In a class of 75 students 45 students like to play football and 20 students like to play cricket. Given that there are 12 students who like to play cricket and like to play football.

a.) Find the number of students who don't like to play cricket.

b.) If a student is selected at random, what is the probability of him

being a student who doesn't like to play cricket but likes to play football.

6.) i.) Solve the following simultaneous equations to find  $x$  and  $y$ .

a.)  $5x + 7y = -1$

$$4x + 2y = 1$$

b.)  $3x + y = 4$

$$3y - x = 22$$

ii.) Solve the following quadratic equations.

a.)  $6x^2 - x - 1 = 0$

b.)  $5x^2 + 11x + 2 = 0$

iii.) Solve the following equations with modulus.

a.)  $4|x| + 2 = 2(|x| + 1)$

b.)  $2|x + 1| = 3(|x + 1| - 4)$

7.) i.) Subject  $u$  in each of the following formulae.

a.)  $\frac{u}{a} + \frac{u+b}{c} = d$

b.)  $\frac{u+a}{u+b} = a^2 + b^2$

ii.) Solve the following inequalities and represent the solutions on a number line.

a.)  $9 - 4x^2 < 0$

b.)  $2x^2 + 8x - 4 \leq x^2 + 5x$

iii.) Expand  $(x + 1)^5$ .

- 8.) i.) In a bag there is a certain number of balls with letters A,B,C and D labeled on them. The ratio of number of balls  
 $A : B : C : D = 4 : 7 : 3 : 1$ . If the number of "B" balls is 35,
- a.) Find the number of "C" balls.
  - b.) Find the total number of balls in the bag.
- ii.) It costs Rs. 1000 for Kaluarachchi to finish a painting. He sells the painting to an art gallery keeping a 5% profit to himself. The same painting was bought from the art gallery by a collector for Rs. 2100. What is the profit percentage earned by the art gallery by selling this painting.
- iii.) In a bookshop the marked price of an exercise book is Rs.  $x$ . A discount of 10% is given when buying two books. Hemamala buys 2 exercise books and it costs him Rs. 81. Calculate  $x$ .