

UNIVERSITY OF COLOMBO - SRI LANKA

FACULTY OF ARTS

FIRST YEAR EXAMINATION IN ARTS (SEMESTER I) – 2018/2019

FND 1107 – BASIC MATHEMATICS

(Time: Two Hours)

Answer only four (04) questions

No. of questions: 08

No. of pages: 04

(Each question carries equal marks)

1.

a. Simplify the following expressions.

i.
$$\frac{3^7 \times 3^{-2} \times 3^6 \times 3^{-3} \times 3^1}{3^{-5} \times 3^4 \times 3^{-6}}$$

ii.
$$\frac{2 \times \left(\frac{m}{n}\right)^3 \times \left(\frac{m}{n}\right)^{-5} \times \frac{m^3}{n^6}}{m^2}$$

iii.
$$\frac{(xy \times yz \times xz)^2 \times (x^2 yz \times xy^2 z \times xyz^2)}{(xyz)^3}$$

b.

i. Prove that for any positive real numbers a and b ,

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

ii. If $\log_{10} 2 = 0.3$ and $\log_{10} 3 = 0.48$, Find the value of $\log_{10} 5$.

Hence or otherwise, calculate the value of $\log_{10} \left(\frac{45}{4}\right)$.

2.

a. Represent the range of values of x that satisfy the following inequalities on a number line.

i. $2x + 5 > x + 3$

ii. $2x^2 - 10x + 12 < 0$

iii. $8x^2 + 8x + 8 \geq 2x^2 + 13x + 7$

b. Solve the following equations.

i. $|x + 2| = 8$

ii. $2|x - 1| + 3 = 9$

iii. $4|2x + 1| - 7 = |2x + 1| + 14$

iv. $3(|x| + 4) - 4 = 5(|x| - 1) + 9$

3.

a. Find the value/values of x in the following equations.

i. $8 = \frac{x-2}{x+1} + \frac{x-5}{2x+2}$

ii. $2^{\frac{x}{x-1}} \times 4^{\frac{3}{4x-1}} = 16$

iii. $30x^2 - 5x - 10 = 0$

b. Solve following pairs of simultaneous equations.

i. $3x + 2y = 25$
 $2x - y = 12$

ii. $4x + 3y = -10$
 $3x - 2y = 1$

4.

a. Factorize the following expressions

i. $6x^2 - x - 12$

ii. $\frac{x^2}{6} - x + \frac{3}{2}$

iii. $\frac{x^2}{20} - 5$

iv. $a^2c - 4abc + 4b^2c$

v. $2a^3 - 2ab^2 + a^2b - b^3$

b. Using the knowledge of factors, evaluate the following expressions.

i. 1007×993

ii. 1118×1104

5.

a. Make u as the subject in following equations.

i. $S = L + vt + \frac{1}{2}ut^2$

ii. $K = \frac{1}{g} \left(gK_0 - \frac{(u-v)}{2a} \right)$

iii. $P = \sqrt{R - \sqrt{Q + u}}$

iv. $\frac{a-u}{n-n_1} = \frac{b-u}{m-m_1}$

v. $H = \frac{1}{2}gt - \frac{t^2}{u^3}$

b.

i. If $f(x) = \frac{4x^2+9x+2}{4x^2+10x+4}$, calculate the value of $f(-\frac{1}{4})$, $f(\frac{1}{2})$ and $f(\frac{1}{4})$.

ii. If $x = 3$, $y = 4$ and $z = 5$ evaluate the value of $\frac{x^3yz+xy^3z-xyz^3}{x^2+y^4+z^8}$.

6.

a.

i. A and B are two cuboids such that the ratios between length, width and height of A and B are 2: 1, 3: 5 and 7: 6 respectively. Find the ratio between the volume of A and B.

ii. A father divides an amount of Rs. 100, 000 among his three sons Nimal, Amal and Kamal. The amount that Kamal has got is twice as Nimal's amount. If Amal's amount is $\frac{1}{5}$ of Nimal's amount, find the amounts that Nimal, Kamal and Amal received.

b.

i. Sama builds a chair at a cost of Rs. 3000 and sells it to Rama, keeping a profit of 5%. Rama sells the chair to Ama at a loss of 10%. How much did Ama pay for the chair?

ii. To increase the area of a circle by 800%, what is the percentage that its radius should be increased?

7.

a. Evaluate the following expressions.

i. $\frac{\left(\frac{1}{2} + \frac{1}{3}\right)}{4} + \frac{\left(\frac{5}{6} - \frac{2}{3}\right)}{5}$

ii. $\frac{\frac{1}{3} \times \left(\frac{1}{2} + \frac{1}{5} - \frac{11}{20}\right) + \frac{9}{10}}{4}$

iii. $\left(1\frac{1}{2} + 1\frac{1}{3} + 1\frac{1}{4}\right) \div \left(2\frac{1}{2} - 2\frac{1}{3} + 2\frac{1}{4}\right)$

b. Simplify the following fractions and rationalize the denominator

i. $\frac{1}{1+\sqrt{2}} - \frac{\sqrt{2}}{1+\sqrt{2}}$

ii. $\frac{4}{\sqrt{3}+\sqrt{6}} + \frac{1}{1+\sqrt{2}}$

iii. $\frac{1}{1+\sqrt{5}} - \frac{2}{1-\sqrt{5}} + \frac{4}{5+5\sqrt{5}}$

iv. $\frac{11}{\sqrt{3}+\sqrt{2}} - \frac{4}{\sqrt{6}-2}$

8.

a. A person deposited Rs. 600 000 at 15% interest per annum as a fixed deposit in a certain investment company. Find the total amount to be collected at the end of 3 years,

i. On simple interest basis

ii. On compound interest basis with annual compounding.

b. A person who borrowed Rs. 900 000 from a certain bank pays back the loan with the interest after two years. Find the amount to be paid,

i. If the bank charges 13% per annum on simple interest basis.

ii. If the bank charges 2% per month on compound interest basis with annual compounding.
