Q.1 Multiple choice Questions. Choose of the correct answer. **(K.B)**

(i) **If $a^x = n$, then…**

(a) $a = \log_x n$ **(b)** $x = \log_n a$

(c) $x = \log_a n$ **(d)** $a = \log_n x$

(ii) **The relation $y=\log_z x$ implies…**

(LHR 2017, GRW 2014, FSD 2015, 16, MTN 2014, 15, 17, BWP 2017)

(a) $x^y=z$ **(b)** $z^y=x$

(c) $x^z=y$ **(d)** $y^z=x$

(iii) **The logarithm of unity to any base is…**

(a) 1 **(b)** 10

(c) e **(d)** 0

(iv) **The logarithm of any number to itself as base is…**

(LHR 2016, FSD 2014, 15, D.G.K 2014)

(a) 1 **(b)** 0

(c) e **(d)** 10

(v) **log e=…,where e ≈ 2.718**

(a) 0 **(b)** 0.4343

(c) ∞ **(d)** 1

(vi) **The value of $\log\left(\frac{p}{q}\right)$ is…**

(a) $\log p - \log q$ **(b)** $\frac{\log p}{\log q}$

(c) $\log p + \log q$ **(d)** $\log q - \log p$

(vii) **log *p*-log *q* is same as …**

(a) $\log\left(\frac{q}{p}\right)$ **(b)** $\log(p-q)$

(c) $\frac{\log p}{\log q}$ **(d)** $\log q - \log p$

(viii) **log(m^n) can be written as…** **(K.B+U.B)**

(LHR 2013, 14, SWL 2013, 15, BWP 2013, 14, FSD 2013, 17, RWP 2016)

(a) $(\log m)^n$ **(b)** $m \log n$

(c) $n \log m$ **(d)** $\log(mn)$

(ix) $\log_b a \times \log_c b$ **can be written as…** **(K.B+U.B)**

(a) $\log_a c$ **(b)** $\log_c a$

(c) $\log_a b$ **(d)** $\log_b c$

(x) $\log_y x$ **will be equal to…** **(U.B)**

(a) $\frac{\log_z x}{\log_y z}$ (b) $\frac{\log_x z}{\log_y z}$

(c) $\frac{\log_z x}{\log_z y}$ (d) $\frac{\log_z y}{\log_z x}$

ANSWER KEY

i	ii	iii	iv	v	vi	Vii	viii	ix	x
c	b	d	a	b	a	D	c	b	c

Q.2 Complete the following: **(K.B)**

(i) For common logarithm, the base is…

(ii) The integral part of the common logarithm of a number is called the …

(iii) The decimal part of the common logarithm of a number is called the …

(iv) If x = log y, then y is called the… of x.

(v) If the characteristic of the logarithm of a number have...zero(s) immediately after the decimal point.

(vi) If the characteristic of the logarithm of a number is 1, that number will have digits in its integral part.

ANSWER KEY

i	ii	iii	iv	v	vi
10	Characteristic	Mantissa	Antilogarithm	One	2

Q.3 Find the value of x in the following. **(A.B)**

(i) $\log_3 x = 5$

Solution:

$\log_3 x = 5$

Write in exponential form.

$3^5 = x$

$243 = x$

Or $x = 243$

(ii) $\log_4 256 = x$ **(D.G.K 2014, SGD 2017)**

Solution:

$\log_4 256 = x$

Write in exponential form

$4^x = 256$

$4^x = 4^4$

$x = 4$ $\because$ bases are same

(iii) $\log_{625} 5 = \frac{1}{4}x$ **(LHR 2014)**

Solution:

$\log_{625} 5 = \frac{1}{4}x$

Write in exponential form

$(625)^{\frac{1}{4}x} = 5$

$(5^4)^{\frac{x}{4}} = 5$

$5^x = 5^1$

$x = 1$ $\because$ bases are same

(iv) $\log_{64} x = -\frac{2}{3}$

Solution:

$\log_{64} x = -\frac{2}{3}$

Write in exponential form

$(64)^{\frac{-2}{3}} = x$

$$\left(4^3\right)^{-\frac{2}{3}} = x$$

$$4^{-2} = x$$

$$\frac{1}{4^2} = x$$

$$\frac{1}{16} = x$$

Q.4 Find the value of x in the following. **(A.B)**

(i) $\log x = 2.4543$

Solution:

$\log x = 2.4543$

Taking antilog on both sides

$x = \text{antilog}\, 2.4543$

$x = 284.6$

(ii) $\log x = 0.1821$ **(FSD 2014)**

Solution:

$\log x = 0.1821$

Taking antilog on both sides

$x = \text{antilog}\, 0.1821$

$x = 1.521$

(iii) $\log x = 0.0044$ **(LHR 2016)**

Solution:

$\log x = 0.0044$

Taking antilog on both sides

$x = \text{antilog}\ 0.0044$

$x = 1.010$

(iv) $\log x = \bar{1}.6238$

Solution:

$\log x = \bar{1}.6238$

Taking antilog on both sides

$x = \text{antilog}\, \bar{1}.6333$

$x = 0.4206$

Q.5 If $\log 2 = 0.3010$, $\log 3 = 0.4771$, and $\log 5 = 0.6990$ then find the values of the following. **(A.B)**

(i) $\log 45$

Solution:

$\log 45$

$= \log\left(9 \times 5\right)$

$= \log\left(3^2 \times 5\right)$

Applying 1st law of logarithm

$= \log 3^2 + \log 5$

Applying 3rd law of logarithm

$= 2\log 3 + \log 15$

Putting the values

$= 2\left(0.4771\right) + 0.6990$

$= 0.9542 + 0.6990$

$= 1.6532$

(ii) $\log \frac{16}{15}$

Solution:

$$\log \frac{16}{15} = \log \frac{2^4}{3 \times 5}$$

Applying laws of logarithm

$= \log 2^4 - \log\left(3 \times 5\right)$

$= 4\log 2 - \left(\log 3 + \log 5\right)$

$= \log 2^4 - \log 3 - \log 5$

$= 4\log 2 - \log 3 - \log 5$

Putting the values

$= 4\left(0.3010\right) - 0.4771 - 0.6990$

$= 1.2040 - 0.4771 - 0.6990$

$= 0.0279$

(iii) $\log 0.048$

Solution:

$$\log 0.048 = \log \frac{48}{1000}$$

$$= \log \frac{2 \times 2 \times 2 \times 2 \times 3}{2 \times 2 \times 2 \times 5 \times 5 \times 5}$$

$$= \log \frac{2^4 \times 3}{2^3 \times 5^3}$$

$= \log 2^4 + \log 3 - \log 2^3 - \log 5^3$

Applying 3rd law of logarithm

$= 4\log 2 + \log 3 - 3\log 2 - 3\log 5$

$= 4\left(0.3010\right) + 0.4771 - 3\left(0.3010\right) - 3\left(0.6990\right)$

$= 1.2040 + 0.4771 - 0.9030 - 2.0970$

$= -1.3189$

$= -2 + 2 - 1.3189$

$= -2 + 0.6811$

$= \bar{2}.6811$

Q.6 Simplify the following. (A.B)

(i) $\sqrt[3]{25.47}$

Solution:

Let $x = \sqrt[3]{25.74} = (25.47)^{\frac{1}{3}}$

Taking log on both sides

$\log x = \log(25.47)^{\frac{1}{3}}$

Applying 3rd law of logarithm

$= \frac{1}{3}\log 25.47$

$= \frac{1}{3}(1.4060)$

$\log x = 0.4687$

Taking antilog on both sides

$x = \text{anti}\log 0.4687$

$x = 2.943$

(ii) $\sqrt[5]{342.2}$

Solution:

Let $x = \sqrt[5]{342.2}$

$x = (242.)^{\frac{1}{5}}$

Taking log on both sides

$\log x = \log(342.2)^{\frac{1}{5}}$

Applying 3rd law of logarithm

$\log x = \frac{1}{5}\log 342.2$

$= \frac{1}{5}(2.5343)$

$\log x = 0.5069$

Taking antilog on both sides

$\log x = \text{antilog}\, 0.5069$

$x = 3.213$

(iii) $\frac{(8.97)^3 \times (3.95)^2}{\sqrt[3]{15.37}}$

Solution:

Let $x = \frac{(8.97)^3 \times (3.95)^2}{\sqrt[3]{15.37}}$

Taking log on both sides

$\log x = \log \frac{(8.97)^3 \times (3.95)^2}{\sqrt[3]{15.37}}$

$= \log(8.97)^3 + \log(3.95)^2 - \log(15.37)^{\frac{1}{3}}$

$= 3\log 8.97 + 2\log 3.95 - \frac{1}{3}\log 15.37$

$= 3(0.9528) + 2(0.5966) - \frac{1}{3}(1.1867)$

$= 2.8584 + 1.1932 - 0.3956$

$\log x = 3.656$

Taking antilog on both sides

$x = \text{antilog}\, 3.656$

$x = 4529$