Chapter -13

Exponents and Powers

- **Exponents:** Exponents are used to express large numbers in shorter form to make them easy to read, understand, compare and operate upon.
- **Expressing Large Numbers in the Standard Form:** Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific motion.
- Very large numbers are difficult to read, understand, compare and operate upon. To make all these easier, we use exponents, converting many of the large numbers in a shorter form.
- The following are exponential forms of some numbers?

 $10,000 = 10^{4}$ (read as 10 raised to 4)

$$=$$
 ,
 $128 = 2^7$.

Here, 10, 3 and 2 are the bases, whereas 4, 5 and 7 are their respective exponents. We also say, 10,000 is the 4th power of 10, 243 is the 5th power of 3, etc.

• Numbers in exponential form obey certain laws, which are: For any non-zero integers a and b and whole numbers m and n,

$$(a) a^{m} \times a^{n} = a^{m+n}$$

$$(b) a^{m} \div a^{n} = a^{m-n}, m > n$$

$$(c) \left(a^{\mathrm{m}}\right)^{\mathrm{n}} = a^{\mathrm{m}}$$

$$(d) a^{m} \times b^{m} = (ab)^{m}$$

- $(e) a^{m} \div b^{n} = \begin{pmatrix} \\ \\ b \end{pmatrix}^{m}$
- (f) $^{0} = 1$
- (g) (-1) even number = 1 (-1) odd number = -1