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?

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

  $= \quad ,$

  $128 = 2^7$.

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

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

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

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

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

  $(e)\ a^m \div b^n = \left(\quad \right)^m$ b

  (f) $^0 = 1$

  (g) (–1) even number = 1 (–1) odd number = – 1