Example 6-1

A DC generator has the following specifications:
- Stator (filed): 10 poles;
- Armature (rotor): Wave winding, 72 coils, 10 turns per coil;
- Flux density under pole face: 0.1 *T;*
- Total pole face area: 1 m^2; and
- Rotor speed: *3600 rpm.*

Find:

(a) The number of parallel paths in the armature of the machine;
(b) The total number of conductors in the armature;
(c) The generated voltage at the terminals of the DC generator;
(d) The current rating of the machine if the current rating of the armature conductors is *50 A*: and
(e) The current rating of the machine in the case of lap winding on the armature.

a. Wave winding $\rightarrow$ $\boxed{a = 2 \text{ paths}}$

b. $Z = (\#\text{ of coils})(\#\text{ of turns per coil})(2 \text{ conductors/turn}) = 70 \times 12 \times 2 = \boxed{1440}$

c. $E_{gen} = \frac{ZP}{60a}\phi n$

$= \frac{ZP}{60a}(BA_p)n = \frac{1440 \times 10}{60 \times 2} \times 0.01 \times 3600 = \boxed{4320\ V}$

d. $I_{rated} =$ Conductor current rating $\times$ # of parallel paths $= 50 \times 2 = \boxed{100}$

e. Lap winding $\rightarrow$ $a = P = 10$

$I_{rated} = 50 \times 10 = \boxed{500\ A}$