1) Calculate capacity of generator

a) Single phase supply - 230V 72 light fittings of 100W
pf = 0.95 lag

b) 6 heaters , 20A

c) 3 5KW motors pf 0.8
3-phase

d) 1 11KW pf 0.85

e) 1 50KW pf 0.85

Case 1: a) b) c) d) e)

Item	Transient State	Steady State	Previous State + Current state
(a)			
72 light fittings			
Single-phase	—	$\frac{72}{3} \div 0.95 \times 100$	
~~3-phase~~	—	$= 2526.315W$	7.579KW
3-phase		$\frac{72}{0.95} \times 100$	7.579 KVA
		$= \cancel{75}\ 7.579KW$	
(b) 6 heaters (1φ)	—	$\cancel{8}\ 20 \times 230 \times 2$	7.579+
	~	$= 9200W$	$27.6 = 27$
(3φ)		$20 \times 230 \times 6$	10.35
		$= 27.6kW$	KV
(c) 3 no. 5kW motor 1φ	$6 \times \frac{5kW}{0.8} = 37.5$	$\frac{5kW}{0.8} = 6.25kW$	7.579+
			27.6 + 112.5
3φ	$6 \times \frac{15}{0.8} = 112.5$	$\frac{15kW}{0.8} = 37.5kW$	= 147.679KW
			KV
(3φ)			7.579+27.6+
(d) 1 11kW 0.85	$\frac{11}{0.85} \times 6 = 77.64$	$\frac{11}{0.85} = 12.941$	37.5 + 77.64
			= 150.319KVA
(e) 1 50kW 0.85	$\frac{50}{0.85} \times 25 = 147.059$	$\frac{50}{0.85} = 58.824$	7.579+27.6+
			37.5 + 12.941
			+ 147.059
⟹ Generator size = 250kVA selected			= 232.679 KVA

Using values from previous table

Previous + current

(e)   ~~117.5~~ 147.059 KVA

(d) $58.824 + 77.64 = 136.464$ KVA

(c) $112.5 + ~~8~~ 12.941 + 58.824 = 184.265$ KVA

(b) $27.6 + 37.5 + 12.941 + 58.824 = 136.865$ KVA

(a) $7.579 + 27.6 + 37.5 + 12.941 + 58.824 = 144.44$ KVA

$\Rightarrow$ Generator selected = 200 KVA

2) UPS supports   3-phase   50Hz   150KVA   @ 0.85pf

$\eta = 90\%$

310 - 465V DC

nominal V = 2V 1.7V

(a) Number of cells required = $\dfrac{310}{1.7}$

$= 182.35$

$\approx 183 \text{ cells}$

(b) Current requirement = $\dfrac{150 \times 0.85}{0.9 \times 67}$ $\dfrac{150 \times 0.85}{}$ $\dfrac{150 \times 10^3 \times 0.85}{0.9 \times 310}$

$= 456.989$

$\approx 457A$

(c) Capacity of each cell = $\dfrac{150 \times 10^3 \times 0.85}{0.9 \times 183}$

$= 774.13 W$