NAME: FAWAD REHMAN
ID: 5053
PAPER: PSA
INST: ENGR. Shahyan Tariq
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Question No 1.

(a).

Answer:

→ Four Conditions to connect generator to the gird.

1. The three-phase voltage must have the same frequency as the gird.
2. The three-phase voltage must have the same amplitude at its terminals as the one of the gird voltage.
3. The three-phase voltage must have the same phase sequence as the gird voltage.
4. The three-phase voltage must be in phase with the gird voltage.

Question No. 1.

(b)

Answer:

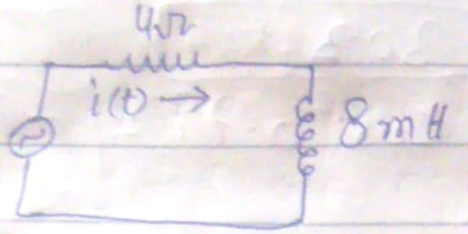
→ A generator connot deliver power to an electrical power system unless all the afformentioned parameters exactly match those of the network. the need for synchronization arises when two or more alternators work together to supply the power to the load. Since electrical load do not remains constant, the two or more generators supplying the power needed to be interconnected and operate in parallel to handle larger loads.

→ The active power and reactive power canbe outputted simultaneously. If the generator is made into an asynchronously, generator the generator will absorb a large number of reactive power after gird connection, which will reduce the system voltage and make the power gird reactive power gap too large to maintain the qualified voltage.

Question No 2.

(a)

Solution:



$V = 110\angle 50^\circ$

$f = 60Hz$

$R = 4\Omega$

$X = \omega L = 3$

$|Z| = \sqrt{4^2+3^2} = 5 \quad \phi = 36.9^\circ$

$I = \frac{V}{Z} = \frac{110\angle 50^\circ}{5\angle 36.9^\circ}$

$= 22\angle 13.1^\circ$

$I = 22\angle 13.1^\circ$ current

$P = (V)(I)$

$P = 110\angle 50^\circ \times 22\angle 13.1^\circ = 2420\angle 63.1^\circ$

$\Rightarrow \theta = \theta_V - \theta_I$

$= 50^\circ - 13.1^\circ$

$= 36.9^\circ$

$P.F = \cos\theta$

$= \cos 36.9$

$P.F = 0.79$ Power Factor

$P = |S| \cos\theta$

$S = \frac{P}{\cos\theta}$

$$S = \frac{2420 < 63.1^\circ}{0.79}$$

$$\boxed{S = 3063 \text{ KVA}}$$

$\theta = \cos^{-1} 0.79 = -37^\circ$

$Q = |S| \sin\theta$

$= 3063 \sin -37$

$$\boxed{Q = 1843 \text{ Kvar}}$$

Question No 2.

(b).

Solution:

$S = 42.5 + j26$

$\theta = \cos^{-1} 0.85 = 31.78^\circ$

PF of 0.95 requires θ desired $= \cos^{-1} 0.95 = 18.2^\circ$

$S_{new} = 42.5 + j(26 - Q_{cap})$

$\frac{26 - Q_{cap}}{42.5} = \tan 18.2^\circ$

$= 13.80 = 26 - Q_{cap}$

$Q_{cap} = 26 - 13.80$

$= 12.20 \text{ Kvar}$ Ans.

Question No 3.

(a)

Answer:

The balance system is one in which the load are equally distributed in all the three phases of the system. the magnitude of voltages remains same in all the three phases and its is separated by an angle of 120°

It is one in which the impedances in the three phases are identical.

It is the sinusoidal voltages of same amplitude, frequency, but differing by 120° phase difference with one another.

Question No 3.

(b)

Solution:

Currents:

$I_{AB} = \frac{V_{ab}}{Z_\Delta}$

$I_{BC} = \frac{V_{bc}}{Z_\Delta}$

$I_{CA} = \frac{V_{CA}}{Z_\Delta}$

Voltages:

$V_{ab} = \sqrt{3}\, V_a \angle +30$

$= 190.53 \angle 30^\circ V$

$V_{bc} = 190.53 \angle -90^\circ V$

$V_{ca} = 190.53 \angle 150^\circ V$

$I_{AB} = \frac{190.53 \angle 30}{60 \angle 40} = 3.1755 \angle -15^\circ A$

$I_{BC} = \frac{190.53 \angle -90}{60 \angle 40} = 3.1755 \angle -135^\circ A$

$I_{CA} = \frac{190.53 \angle 150}{60 \angle 40} = 3.1755 \angle 105^\circ A$

$P = V I$

$P = 190.53 \times 3.1755$

$P = 602.3$

$P.F = \theta = \cos\theta$

$= -0.46$

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