Q3)

a)

The name of the topology is 12-pulse rectifier. A twelve-pulse bridge consists of two six-pulse bridge circuits connected in series, with their AC connections fed from a supply transformer with two secondary windings and one delta-connected primary winding. One secondary winding is connected in star and the other in delta. Star connected secondary feeds the upper 3-phase diode bridge rectifier, whereas the delta-connected secondary is connected to lower 3-phase diode bridge rectifier. Because of delta-wye(star) connection in secondary windings, there is a 30° phase shift between the two bridges. This results in total 12 pulse at the load. For very high-power rectifiers the twelve-pulse bridge connection is usually used. It is mainly used in HVDC systems with series devices. By using a 12-pulse rectifier, we can achieve less harmonics and this results in lower THD.

For a different variation in the 12-pulse rectifiers, thyristors can be used instead of diodes. When thyristors are used, average voltage of output will decrease depending on firing angle compared to using diodes.Morover, thyristor rectifiers are partially controlled,whereas diodes are not controlled. We can control output voltage by just changing the firing angle of thristor. Thus, thyristors are good devices for controlling purpose.

For another version of 12-pulse rectifier instead of delta-connected primary winding, wye-connection is used in primary side.There is a phase shift between primary side(wye connection) and secondary side(delta connection) by 30°.