

EEU104
Tutorial 10

Chapter 34, Pg 667-668 Exercises 3, 9, 10, 12, 13 & 14
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- 3 Derive, for both star- and delta-connected systems, an expression for the total power input for a balanced three-phase load in terms of line voltage, line current and power factor.
The star-connected secondary of the transformer supplies a delta-connected motor taking a power of 90kW at a lagging power factor of 0.9. If the voltage between lines is 600V, calculate the current in the transformer winding and in the motor winding. Draw circuit and phasor diagrams, properly labeled, showing all voltages and currents in the transformer secondary and the motor.
- 9 Derive the numerical relationship between the line and phase currents for a balanced three-phase delta-connected load.
Three coils are connected in delta to a three-phase, three wire, 400V, 50 Hz supply and take a line current of 0.5A 0.8 power factor lagging. Calculate the resistance and inductance of the coils. If the coils are star-connected to the same power, calculate the line current and the total power. Calculate the line currents if one coil becomes open-circuited when the coils are connected in star.
- 10 The load connected to a three-phase supply comprises three similar coils connected in star. The line currents are 25A and the apparent and active power inputs are 20kVA and 11 kW respectively. Find the line and phase voltages, reactive power input and the resistance and reactance of each coil. If the coils are now connected in delta to the same three-phase supply, calculate the line currents and the active power taken.
- 12 Explain the advantage of connecting the low-voltage winding of the distribution transformers in star.
A factory has the following load with power factor of 0.9 lagging in each phase. Red phase 40A, yellow phase 50A and blue phase 60A. If the supply is 400 V, three-phase, four-wire, calculate the current in the neutral and the total active power. Draw a phasor diagram for phase

and line quantities. Assume that, relative to the current in the red phase, the current in the yellow phase lags by 120° and that in the blue phase leads by 120° .

- 13 A three-phase, 400 V system has the following load connected in delta: between the red and yellow lines, a non-reactive resistor of 100 W; between the yellow and the blue lines, a coil having a reactance of 60 W and negligible resistance; between the blue and the red lines, a loss-free capacitor having a reactance of 130 W. Calculate; (a) the phase currents; (b) the line currents. Assume the phase sequence to be R-Y, Y-B and B-R. Also, draw the complete phasor diagram.
- 14 The phase currents in a delta-connected three-phase load are as follows: between the red and yellow lines, 30A at p.f. 0.707 leading; between the yellow and blue lines, 20A at unity p.f.; between the blue and red lines, 25A at p.f. 0.866 lagging. Calculate the line currents and draw the complete phasor diagram.