

## Circuit Descriptions for Assignment#1

Circuit No. 1: Half-wave Rectifier with R Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 20 \ \Omega$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 2: Half-wave Rectifier with RL Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 20 \ \Omega$   $L = 100 \text{ mH}$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 3: (3a) Half-wave Rectifier with RL Load and FWD

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 20 \ \Omega$   $L = 100 \text{ mH}$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 3: (3b) Half-wave Rectifier with RL Load and FWD

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $L = \text{infinity}$ ,  $I_{\text{load}} = 5 \text{ A}$

Find: a) the average load voltage, b) the rms load voltage, c) the average load current, c) the rms load current (d) the average power absorbed by the load, (e) the power factor of the circuit

Circuit No. 4: Half-wave Rectifier with RC Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 500 \ \Omega$   $C = 200 \ \mu\text{F}$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 5: Full-wave Rectifier with R Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 20 \ \Omega$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 6: (6a) Full-wave Rectifier with RL Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 20 \ \Omega$   $L = 100 \text{ mH}$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 6: (6b) Full-wave Rectifier with RL Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $L = \text{infinity}$ ,  $I_{\text{load}} = 5 \text{ A}$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 7: Full-wave Rectifier with RC Load

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$   $R = 500 \ \Omega$   $C = 200 \ \mu\text{F}$

Find: a) an expression for output voltage, b) an expression for load current, c) an expression for capacitor voltage, d) an expression for diode current, e) the peak-to-peak output voltage ripple, e) the peak diode current f) the average load voltage, g) the average load current, h) the power factor of the circuit.

Circuit No. 8: Three Phase Half-wave Rectifier with RL Load

$V_s = 240$  V (three phase balanced system),  $f = 50$  Hz  $L = \infty$ ,  $I_{load} = 5$  A

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 9: Three Phase Full-wave Rectifier with RL Load

$V_s = 240$  V (three phase balanced system),  $f = 50$  Hz  $L = \infty$ ,  $I_{load} = 5$  A

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 10: Half-wave Phase-controlled Rectifier with R Load

$V_s = 240$  V,  $f = 50$  Hz  $R = 20$   $\Omega$ ,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 11: Half-wave Phase-controlled Rectifier with RL Load

$V_s = 240$  V,  $f = 50$  Hz  $L = \infty$ ,  $I_{load} = 5$  A,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 12: (12a) Half-wave Phase-controlled Rectifier with RL Load and FWD

$V_s = 240$  V,  $f = 50$  Hz  $R = 50$   $\Omega$ ,  $L = 100$ mH,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 12: (12b) Half-wave Phase-controlled Rectifier with RL Load and FWD

$V_s = 240$  V,  $f = 50$  Hz  $L = \infty$ ,  $I_{load} = 5$  A,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 13: Full-wave Phase-controlled Rectifier with R Load

$V_s = 240$  V,  $f = 50$  Hz  $R = 50$   $\Omega$ ,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 14: (14a) Full-wave Phase-controlled Rectifier with RL Load

$V_s = 240$  V,  $f = 50$  Hz  $R = 50$   $\Omega$ ,  $L = 100$ mH,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 14: (14b) Full-wave Phase-controlled Rectifier with RL Load

$V_s = 240$  V,  $f = 50$  Hz,  $L = \infty$ ,  $I_{load} = 5$  A,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 15: (15a) Full-wave Phase-controlled Rectifier with RL Load and FWD

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$ ,  $R = 50 \Omega$ ,  $L = 100 \text{ mH}$ ,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 15: (15b) Full-wave Phase-controlled Rectifier with RL Load and FWD

$V_s = 240 \text{ V}$ ,  $50 \text{ Hz}$ ,  $L = \text{infinity}$ ,  $I_{\text{load}} = 5 \text{ A}$ ,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 16: Three Phase Half-wave Phase-controlled Rectifier with RL Load

$V_s = 240 \text{ V}$  (three phase balanced system),  $50 \text{ Hz}$ ,  $L = \text{infinity}$ ,  $I_{\text{load}} = 5 \text{ A}$ ,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

Circuit No. 17: Three Phase Full-wave Phase-controlled Rectifier with RL Load

$V_s = 240 \text{ V}$  (three phase balanced system),  $50 \text{ Hz}$ ,  $L = \text{infinity}$ ,  $I_{\text{load}} = 5 \text{ A}$ ,  $\alpha = 30^\circ$

Find: a) an expression for output voltage, b) an expression for load current, c) the average load voltage, d) the rms load voltage e) the average load current, f) the rms load current, g) the average power absorbed by the load, h) the power factor of the circuit

### **Format of the Report**

The Report Should contain as follows:

- (i) Circuit diagram
- (ii) Circuit description and operation
- (iii) Key waveforms
- (iv) Mathematical descriptions
- (v) Parameter evaluations
- (vi) Pspice simulation
- (vii) Conclusion