



Final Exam

2017/2018

Note: Answer Five Questions only (Each question is worth 20 marks)

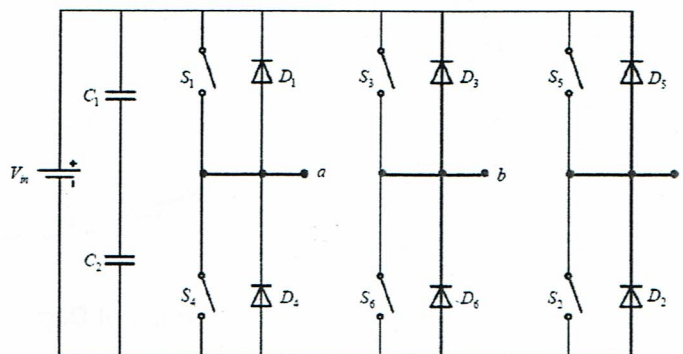
Q1/ A- Fill in the blanks with the appropriate word(s) (10 marks)

- 1- Uncontrolled rectifiers use diode. Whereas, controlled rectifiers use thyristor and/or IGBT in their circuits.
- 2- "THD" is the specification used to describe the quality of output voltage.
- 3- The commutator in the D.C. machines converts AC generated in the armature winding into DC across the brush.
- 4- In a rectifier, electrical power flows from the AC side to the DC side.
- 5- If the input D.C. power of an inverter is 300 Watt. Output AC power is 250 Watt. The efficiency of this inverter is 83.3%.

B- Draw the circuit diagram for a buck-boost converter. Draw its waveforms in the continuous and discontinuous conduction modes. Explain how an isolated output version of the buck-boost converter can be developed and draw its circuit diagram. (10 marks)

Q2/ A three-phase inverter is shown in the figure below has Y-connected balanced load of $R=10\Omega$. The inverter frequency is $f_o = 50$ Hz and the dc input voltage is $V_s = 200$ V. Find the following parameters of the inverter

- 1- The rms line voltage V_L
- 2- The rms phase voltage V_p
- 3- The rms line voltage V_{L1} at fundamental frequency
- 4- The rms phase voltage V_{p1} at fundamental frequency
- 5- The THD per line and phase
- 6- The load power P_o



Three phase inverter circuit

Q3/ For the fully-controlled full wave rectifier, firing angle = 45° , $R=40\Omega$, $V_s=380\sin\omega t$, Calculate

- i) Average output voltage
- ii) Load mean current
- iii) RMS output voltage
- iv) RMS output current
- v) Efficiency

Q4/ A- A boost converter is to be designed with the following values $V_{in}=5V$, $V_0=12V$, and the maximum output power $P_0=40W$. The switching frequency is selected to be $F_s=400KHz$. Assume ideal components, find the value of L if the converter is to remain in CCM at one third the maximum output power. (10 marks)

B- Draw the waveforms for the signals of 180° conduction mode of the transistors and all output voltages from the inverter. How many modes of operation? Write transistor switching sequence for each mode. (10 marks)

Q5/ A 250V shunt motor has an armature resistance of 0.25Ω and a field resistance of 125Ω . At no-load the motor takes a line current of 5.0 A while running at 1200rpm. If the line current at full-load is 52.0A, what is the full-load speed?

Q6/ A 1-phase half wave uncontrolled rectifier is working with $V_s=200\sin\omega t$, with a frequency of 50Hz and a load of $R=20\Omega$ and $L=10mH$ is connected to it. Calculate $V_0(\text{avg})$, $I_0(\text{avg})$, $P_0(\text{avg})$, $V_s(\text{rms})$, $V_0(\text{rms})$, Form factor(FF), Ripple Factor(RF).

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