# EEL843: Major

Note: (i) Draw neat waveforms to scale
(ii) If necessary assume continuous conduction mode
(iii) List the assumptions used in the analysis
(iv) For standard formulations use text book.

Max. Marks: 45
Time: 2 hrs

1. Why the synchronous buck converter is preferred for low voltage and high current applications? Bring out salient features and then discuss its limitations. (7)
2. A dc source is connected to the load, which demands constant dc voltage, via an ideal switch. Determine the condition(s) on the switch-ON time such that the load voltage is constant dc and free from switching frequency components (Assume ideal conditions and load is purely resistive nature). (8)
3. A single-phase 50 Hz symmetrical square-wave inverter feeding a resistive load, R=10 Ω, via an L-C filter as shown in Fig. 1. Design suitable filter parameter(s) such that the load voltage 150 Hz component should be less than 70 V. What is the total harmonic distortion in the load voltage waveform for these filter components? (8)
4. Determine the equivalent impedance ( $Z_{in}=v_g/i_g$ ) offered by the switch-mode dc-dc converter at the input terminals as shown in Fig. 2. Assume the inductor current is always positive and never crosses the time axis, switch and diode will be conducting in complementary fashion. (10)

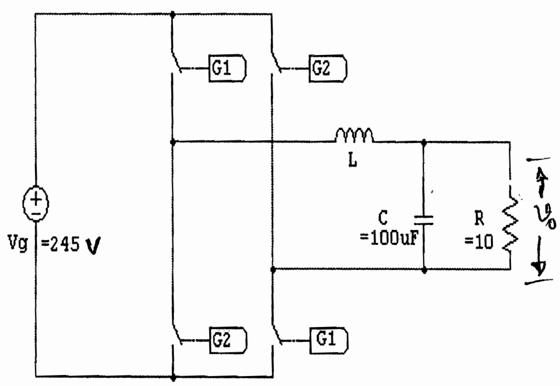


Fig. 1. Square-wave inverter.
(G1, G2 are complementary activated gate signals)

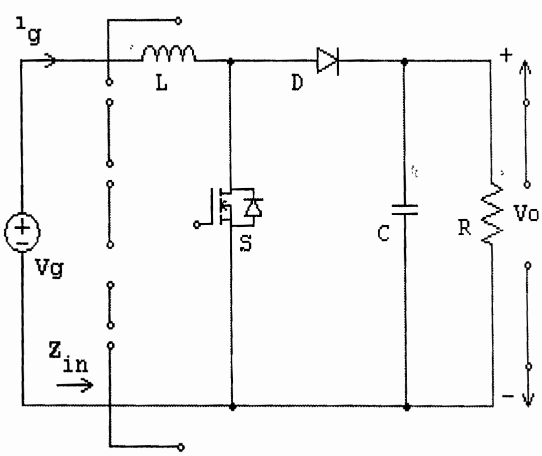


Fig. 2. Switch-mode dc-dc converter.

5. A single-phase 50 Hz symmetrical square-wave inverter feeding an R-L load via an L-C filter as shown in Fig. 3. (i) Discuss the filter parameters effect on the dynamics of the load voltage, (ii) Identify all possible operating cases and then draw the frequency response characteristic for each case, and (iii) discuss how the damping of load voltage is achieved in each case. (12)

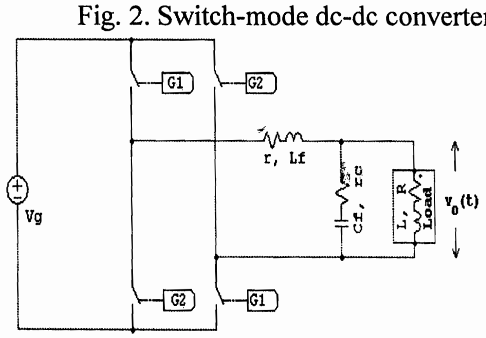


Fig. 3. Square-wave inverter.
(G1, G2 are complementary activated gate signals)

*8th May, 2009 (10.30 ~ 12.30 hrs)*