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FACULTY OF ENGINEERING AND TECHNOLOGY

M.E. (Electrical Power Systems) Examination May/June 2017

Advanced Power Electronics

(Revised)

[Time : Three Hours] **[Max Marks :80]**

Please check whether you have got the right question paper.

N.B Answer any two full questions from each section.

Section A

Q.1 a. What is the principle of operation of buck converter & explain its working with help of waveforms. 10

b. Describe half bridge and full bridge converters configuration. Enumerate its advantages. 10

Q.2 a. what is the principle of phase control? Also derive the performance parameters of a single phase full wave ac controller with RL load. 10

b. A single phase full wave ac voltage controller in figure I has a resistive load of R=10Ω and the input voltage is V_s=120V (rms) 50Hz. The delay angles of thyristors T_1 and T_2 are equal $\alpha_1 = \alpha_2 = \alpha = \frac{\pi}{2}$. Determine (a) the rms output voltage V_o^2 . (b) The input Pf. (c) The average current of thyristors I_A and (d) the rms current of thyristors I_R 10

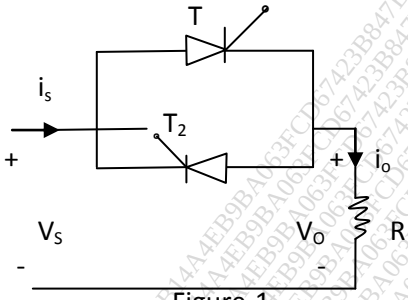

Figure-1

Q.3 a. Explain working of single phase full wave controller with inductive loads? Draw the waveforms for the output voltage v_o and output current i_o and voltage across T_1 10

b. A three phase ac voltage controller. Supplies a Y connected resistive load of R= 5Ω and the line to line input voltage is V_s =208V at 50Hz. Plot the PF against the delay angle α for (a) the full wave controller in figure 2 10

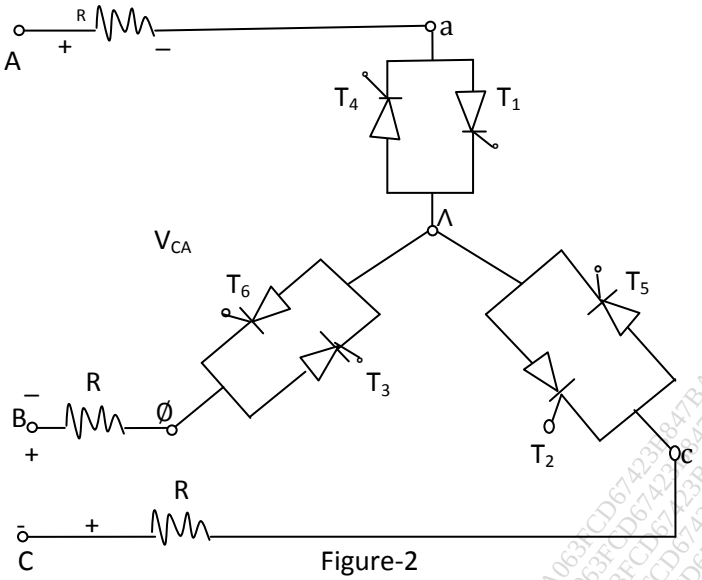

Figure-2

Section B

Q.4 a. Explain all the gate drive techniques in detail 10

b. Describe in detail the techniques for optimizing the base drive of a BJT. 10

Q.5 a. Write the drawback of SPWM? Also describe and suggest other techniques offering improved performance with waveforms. 10

b. A single phase full bridge inverter which uses a uniform PWM with two pulses per half cycles has a load of R=5Ω α=15 mH and C=25μF. The dc input voltage is V_s =220v. Express the instantaneous load current i_o (t) in a Fourier series for m=0.8, f_o =50Hz. 10

Q.6 a. Explain the circuit operation and equivalent circuits of series resonant inverter 10

b. A parallel resonant inverter delivers a load power of P_L=2Kw at a peak sinusoidal load voltage of V_p =170v and at resonance. The load resistance is R=10Ω. The resonant frequency is f_o=25KHz. Determine (a) The dc input current I_s (b) The quality factor Q_p if it is required to reduce the load power to 500w by frequency control so that μ=1.25 (C) the inductor L (d) The capacitor C 10