

International Islamic University Chittagong (IIUC)
Department of Electronic and Telecommunications Engineering
Final Examination, Autumn- 2021

Course Code: ETE-2445 Course Title: Electrical Machine and Industrial Electronics
 Full Marks: 50 Time: 2 Hours 30 Minutes

(Figures in the margin indicate full marks)
Group-A

1. (a) Write the advantage of electronic speed control of DC motor over conventional methods. 6 CO1
CO2
 Describe the process of Speed control of DC shunt motor using Power Electronic devices.
- (b) The speed of a separately excited d.c. motor is controlled by a chopper. The supply voltage is 120 V, armature circuit resistance= 0.5 Ω , armature circuit inductance= 30 mH and motor constant= 0.05 V/r.p.m. the motor drives a constant load torque requiring an average current of 20 A. Assume motor current is continuous. Calculate (i) the range of speed control (ii) the range of duty cycle. 4 CO3
2. (a) What does mean by uncontrolled rectifier. Describe single phase Full-wave rectifier with R load. Draw output voltage; also compare the Peak inverse voltage of a Diode for Full Bridge and Center-tapped type rectifier. 6 CO3
- (b) The rectifier in Figure 1 has an RL load. Use the method of Fourier series to obtain expressions for output voltage $v_0(t)$. 4 CO3

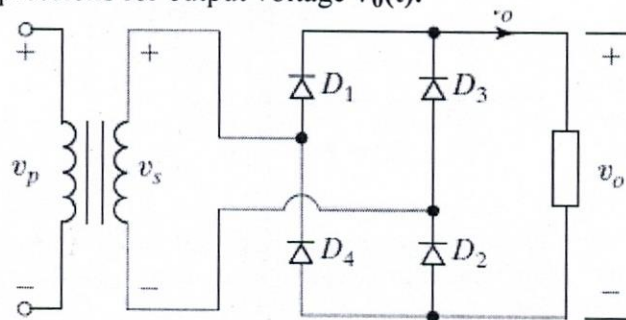


Figure 1

Or

3. (a) What is a controlled rectifier? Why it is called controlled. Classify controlled rectifier. 5 CO3
 How a phase control thyristor turn on and turn off.
- (b) Draw the single phase full wave controlled rectifier with proper wave-form for RL load. Also Write the equation for average output voltage, normalized average output voltage and RMS output voltage. 5 CO3

Group-B

[Answer any three sets of the following questions]

4. (a) What is duty cycle? Explain the process of generation of Duty cycle 4 CO3
 (b) Design a regulator whose has an input voltage is $V_s = 10\text{ V}$ and average output voltage is $V_a = 15\text{ V}$. (i) Determine the duty cycle k , (ii) Briefly explain the operation of regulator, (iii) Derive equation for switching frequency. 6 CO3
5. (a) Briefly describe the operation of a Half inverter with output equation and suitable waveform. 5 CO3
 (b) The single phase Full bridge inverter has a resistive load $R=3\ \Omega$ and the dc input voltage is $V_s= 50\text{ V}$. determine (i) the rms output voltage at the fundamental frequency V_{o1} , (ii) the output power P_o , (iii) the average and peak currents of each transistor, (iv) the total harmonic distortion, and (v) distortion factor. 5 CO3
6. (a) What is a cycloconverter? Briefly explain the operation of single phase cycloconverter to get output frequency, $f_0=3f_i$ 5 CO3
 (b) The converter in Figure 5.4 has a load resistance $R = 0.25\ \Omega$, input voltage $V_s = 550\text{ V}$, The average load current $I_a = 200\text{ A}$ and chopping frequency $f = 250\text{ Hz}$. Use the average output voltage to calculate the load inductance L , which would limit the maximum load ripple current to 10% of I_a . 5 CO3

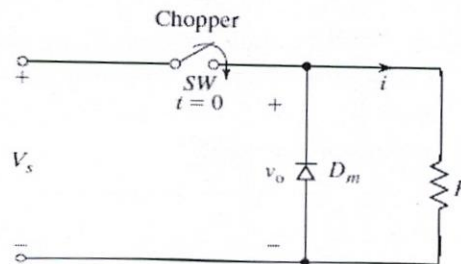


Figure 2

7. (a) Describe the operation of following single phase full wave controller with suitable waveforms. Also write the advantage of using common cathode system in single phase full wave controller. 5 CO3

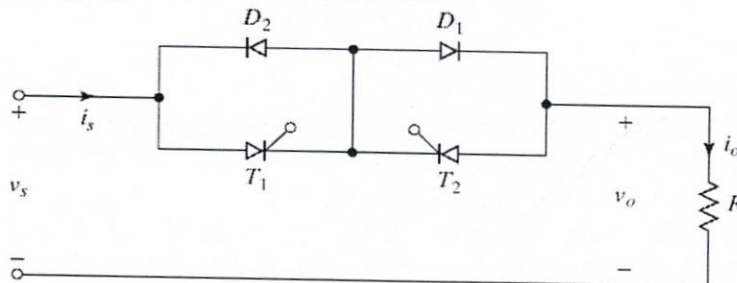


Figure 3

- (b) A single phase ac voltage controller has a resistive load of $R = 20 \Omega$ and the input voltage is $V_s = 110 \text{ V}$, 50 Hz . The thyristors switch is on for $n = 75$ cycles, and is off for $m = 25$ cycles. Determine (i) the rms value of output voltage, (ii) the input power factor, and (iii) the average and rms current of thyristor. 5 CO3