International Islamic University Chittagong (IIUC)

Department of Electronic and Telecommunications Engineering
Final Examination, Spring- 2019

Course Code: ETE-2425 Course Title: Electrical Machine and Industrial Electronics

Full Marks: 50 Time: 2 Hours 30 Minutes

(Figures in the margin indicate full marks)

Group-A

[Answer any two sets of the following questions]

1. (a) Write the methods of speed control of DC motor from AC supply. 2
   (b) Describe the method of Speed control of DC series motor using TRIAC and DIAC. 4
   (c) 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

2. (a) What does mean by harmonics and harmonic factor. 2
   (b) Compare the rectification efficiencies of half wave and full wave uncontrolled rectifier. 3
   (c) A single phase half wave rectifier has a purely resistive load R, Determine (i) the efficiency, (ii) the Form factor, (iii) the ripple factor, (iv) the transformer utilization factor, (v) the crest factor of the input current. 5

3. (a) Describe the use of controlled rectifiers? 2
   (b) Draw circuit diagram of three phase semi converter drive explain its operation with the help of waveform. 5
   (c) A phase controlled converter has a purely resistive load and delay angle $\alpha=\pi/3$, determine the rectification efficiency, the form factor, ripple factor, transformer utilization factor and peak inverse voltage. 3

Group-B

[Answer any three sets of the following questions]

4. (a) What is a dc chopper? Mention some application of DC-DC converter. 2
   (b) "*A buck-boost regulator provides an output voltage that may be less than or greater than the input voltage*" Justify the above statement. 4
   (c) The dc converter has a resistive load of R= 10 and the input voltage is V_s=220 V. When the converter switch remains on, its voltage drop is v_{ch} = 2 V and the chopping frequency is f= 1 kHz. If the duty cycle is 50%, determine (i) the 4

average output voltage V_a, (ii) the rms output voltage V_o, (iii) the converter efficiency, (iv) the effective input resistance R_i of the converter.

5. (a) Develop the schematic diagram, circuit diagram and output waveforms for 180^0 conduction of three phase inverter. 5

   (b) The single phase half bridge inverter has a resistive load R=3 Ω and the dc input voltage is V_s= 50 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

6. (a) What is a cycloconverter? 2

   (b) Briefly explain the operation of single phase cycloconverter to get output frequency, $f_0=4f_i$ 4

   (c) Write the method of generation of duty cycle. 4

7. (a) Write most common applications of ac voltage controllers. 2

   (b) Draw the Circuit and wave form of Single phase bidirectional controller with resistive load at firing angle 45^0 4

   (c) A single phase ac voltage controller has a resistive load of R= 20 Ω and the input voltage is V_s= 110 V, 50 hz. The thyristors switch is on for 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. 4