

2074

B.E. (Electrical and Electronics Engineering)

Seventh Semester

PC-EE-701: Power Electronics and Drives

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 (Part-A) which is compulsory and selecting two questions each from Part B-C.

x-x-x

PART-A(Attempt all questions)

1. (i) State the difference between Current source Inverter and Voltage Source inverter. (2)
- (ii) Draw the circuit for single phase step-down bridge cycloconverter feeding a RL Load. Comment on type of commutation required in this case. (2)
- (iii) What is multiple pulse Modulation as required in inverters and write formula for number of pulses that can be obtained in one half cycle using multiple pulse modulation. (2)
- (iv) Draw the circuit of a Chopper Drive working in a motoring mode for a dc motor. (2)
- (v) Draw the circuit of two phase, three level flying capacitor MLI. (2)

PART-B(Attempt any two)

2. (i) A single-phase full bridge inverter has RLC load of $R=4$ ohms, $L=35\text{mH}$ and $C=155\text{microFarad}$. The dc input voltage is 230 V and the output frequency is 50 Hz. Find the expression for load current up to 5th harmonics. Also calculate value of fundamental load current. (5)
- (ii) For a single-phase voltage controller feeding a RL load, draw its circuit and develop a relationship between firing angle and load phase angle? Under what conditions, conduction angle becomes equal to π and what happens if firing angle does not fall in control range for a voltage controller. (5)
3. (i) Discuss why three phase to single phase cycloconverter requires positive and negative group phase-controlled converters. For a three phase to single phase CC that accepts 230 V/50 hz supply, draw its schematic diagram, explain the sequence of triggering of SCRs for obtaining single phase output voltage at 6.25 Hz. Also draw the output voltage and current waveform as obtained in this case. (6)
- (ii) Draw the configuration for two-phase 3-level diode clamped MLI. Write the switching states to obtain 5 levels of output line voltages from it. (4)
4. (i) Discuss the principles of working of a three-phase bridge inverter with an appropriate circuit diagram. Draw phase and line voltage waveforms for one complete cycle on assumption that each thyristor conducts for 120 degree with resistive load connected in star. Also indicate the sequence of firing of various SCRs. (5)
- (ii) State the advantage of DC Link Static Scherbius Drive over other drives used for Induction motors. Explain its operation to obtain sub-synchronous and super-synchronous speed of Induction Motors. (5)

PART-C (Attempt any two)

5. (i) Draw the circuit of an electric drive which operates on the principle of stator voltage control of an Induction motor. Explain its operation to control the speed of Induction motor. Also draw the speed-torque characteristics as effected by stator-voltage control. (5)
- (ii) A 220V, 1000 rpm, 60 A separately excited dc motor has an armature resistance of 0.1 ohms. It is fed from a single-phase full converter with an ac source voltage of 230V, 50 Hz. Compute the firing angle for motor speed at 600 rpm and firing angle for motor speed of (-500) rpm. (5)
6. Describe modified McMurray Bedforth Half Bridge Inverter with appropriate voltage and current waveforms. The total commutation interval may be sub-divided into certain well-defined modes for the purpose of explaining its operation. (10)
7. (i) Explain on/off control of AC voltage controllers. Derive the expression for output voltage obtained in case of on/off control. (5)
- (ii) Draw and explain a three-phase dc drive capable of two quadrant operation. (5)

x-x-x