

Exam.Code:0937
Sub. Code: 6991

1078
B.E. (Electrical and Electronics Engineering)
Seventh Semester
EE-710: Power Electronic and Drives

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Assume suitably missing data, if any.

x-x-x

- Q1. a. Give the classification of inverters on the viewpoint of connections. (1)
- b. Write the speed governing equations for
 - i. DC motor drive.
 - ii. Induction motor drive.
 - iii. Synchronous machine drive (1, 1, 1)
- c. A single phase voltage controller feeds power to a load of resistance 10 ohms and a supply of $200 \sin 314t$ volts. What will be the average thyristor current in amperes for a firing angle of 90° ? (2)
- d. Only draw the circuit diagram of three-phase full converters feeding a separately excited dc motor. (2)
- e. Draw the circuit arrangement for single phase to single phase mid-point cyclo-converter. (2)

Part-A

- Q2. A single phase voltage controller feeds power to a resistive load of 3Ω from 230 V, 50 Hz source. Calculate:
 - i. the maximum values of average and rms thyristor currents for any firing angle α ,
 - ii. the minimum circuit turn-off time for any firing angle α ,
 - iii. the ratio of third-harmonic voltage to fundamental voltage for $\alpha = \pi/3$,
 - iv. the maximum value of di/dt occurring in the thyristors. (4, 1, 4, 1)
- Q3. A single phase parallel inverter delivers power to a resistive load through a centre tapped ideal transformer. Derive an expression for the capacitor voltage on an assumption of constant source current. Hence, obtain an expression for the circuit turn-off time. (7, 3)
- Q4. Explain the working of
 - i. multi-level inverter.
 - ii. single-phase full-bridge inverter (5, 5)

Part-B

- Q5.a. Explain the working principle of single-phase to single-phase step down cyclo-converter for continuous and discontinuous conductions for a bridge type cyc o-converter.
- b. Also, derive the expression for rms value of output voltage. (4, 4, 2)
- Q6. i. Explain the working of a single phase full converter fed dc drive with appropriate voltage and current waveforms.
- ii. Also, derive an expression for its input pf.
- iii. A 200 V, 1000 rpm , 10 A separately excited dc motor is fed from a single phase full converter with ac source voltage of 230 V, 50 Hz. Armature circuit resistance is 1Ω . Armature current is continuous. Calculate firing angle for rated motor torque at 500 rpm. (5,2,3)
- Q7. Derive the expressions for rotor current, I_2 , Maximum torque, T_{em} , and starting torque for a 3-phase induction motor drive controlled through current source inverter. (3, 5, 2)