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 90^0?   (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 3 Ω 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

P.T.o.

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 cyclo-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)

x-x-x