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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2011 & Onward) (Sem.-4)**POWER ELECTRONICS & MOTORS****Subject Code : BTAR-401****Paper ID : [A1223]****Time : 3 Hrs.****Max. Marks : 60****INSTRUCTION TO CANDIDATES :**

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A**Q1. Answer briefly :**

- a) Define turn-on and turn-off times of an SCR.
- b) Describe the significance of di/dt and dv/dt in SCRs.
- c) Describe LASCR. Also give its industrial applications.
- d) What are line-commutated inverters?
- e) Define holding current and latching current.
- f) Draw the symbol and V-I characteristics of a DIAC.
- g) What is an inverter? List a few industrial applications of inverters.
- h) Explain the basic difference between voltage-source inverter and current-source inverter.
- i) What is pulse width modulation control method in inverters?
- j) Give the applications of cycloconverters.

SECTION-B

- Q2. Draw the two transistor model of SCR and derive an expression for anode current.
- Q3. A thyristor string is made up of a number of SCRs connected in series and parallel. The string has voltage and current ratings of 11 kV and 4 kA respectively. The voltage and current ratings of available SCRs are 1800 V and 1000 A respectively. For a string efficiency of 90%, calculate the number of series and parallel connected SCRs. For these SCRs, maximum off-state blocking current is 12 mA. Determine the value of static equalizing resistance for the string.
- Q4. Describe a voltage-commutated chopper with relevant current and voltage waveforms as a function of time.
- Q5. Why 3-phase to 1-phase cycloconverter requires positive and negative group phase-controlled converters? How should the firing angles of the two converters be controlled?
- Q6. Explain in detail the operation of a single-phase full converter bridge rectifier with RLE load. Describe with circuit diagram and appropriate waveforms.

SECTION-C

- Q7. a) What do you mean by commutation of SCR? Explain class A and class B methods.
b) Discuss how SCRs suffer from unequal current distribution in parallel combination of SCRs.
- Q8. a) A chopper circuit is operating at a frequency of 1 kHz on a 220 V dc supply. If the load voltage is 180 V, calculate the T_{on} and T_{off} of thyristors in each cycle.
b) Discuss the principle of working of a three - phase bridge inverter with an appropriate circuit diagram. Draw voltage waveforms on the assumption that each thyristor conducts for 120° and the resistive load is star-connected. The sequence of firing of various SCRs should also be indicated in the waveforms.
- Q9. Describe the steady state time-domain analysis of type-A chopper.