

Roll No

EX - 504

B.E. V Semester

Examination, December 2015

Power Electronics Devices and Circuits

Time : Three Hours

Maximum Marks : 70

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice. rgpvonline.com
- ii) All parts of each questions are to be attempted at one place.
- iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
- iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Why circuit turn off time should be greater than the thyristor turn off time?
- b) Define the latching current and holding current.
- c) How do you protect SCR from $\frac{dv}{dt}$ and $\frac{di}{dt}$ explain?
- d) Explain the two transistor analogy of Thyristor.

OR

Explain Class D Commutation of thyristor with circuit diagram and waveform.

[2]

2. a) What is commutation angle or overlap angle?
- b) What are the different methods of firing circuits for live commutated converter?
- c) What is the function of freewheeling diodes in controlled rectifier? And also write the advantages of freewheeling diode.
- d) For a 3 phase full converter. Sketch the time variation of input voltage, output voltage and the voltage across are thyristor for one complete cycle for a firing angle of 30° .

OR

Show that the performance of a single-phase full converter as effected by source inductance is given by the relation

$$\cos(\alpha + \mu) = \cos \alpha - \frac{\omega L_s I_o}{V_m}$$

3. a) Why diodes should be connected in antiparallel with the thyristors in inverter circuits? And what type of inverters require these diodes.
- b) What is meant by PWM Control?
- c) What are the disadvantages of the harmonics present in the inverter system?
- d) Explain sinusoidal-pulse modulation as used in PWM inverters. Discuss the conditions under which the number

of pulses generated per half cycle are $\frac{f_c}{2f}$ or $\left(\frac{f_c}{2f} - 1\right)$.

Here f_c and f are the frequencies of carrier and reference signals respectively.

[3]

OR

Describe Mc-Murray Bedford half bridge single-phase inverter with relevant voltage and current waveforms.

4. a) What is meant by FM Control in a dc chopper?
- b) What are the different types of Chopper with respect to Commutation Process and what is meant by Current Commutation.
- c) For a type A chopper, dc source voltage = 230 V, Load resistance = 10Ω . Take a voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4 calculate average and rms value of output voltage.
- d) Explain the operation of four quadrant or (Type E) chopper with the help of diagram.

OR

Describe a voltage commutated chopper with relevant current and voltage waveforms as a function of time.

5. a) What are the two methods of control in ac voltage controllers and what's the difference between them?
- b) What is meant by positive converter group in a cyclo converter?
- c) What is meant by unidirectional or half wave ac voltage controller and what are the disadvantages of this controller?
- d) Describe the working of single phase dual converter.

OR

Explain the working of Buck and Boost regulators.
