Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PCEL 4301

Fifth Semester (Back/Special) Examination – 2013

POWER ELECTRONICS

BRANCH : EEE, ELECTRICAL

QUESTION CODE : D262

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which are compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) Mention the component used for the isolation of base drive signal of power BJT. Draw its internal circuit diagram.

   (b) What is the protection of SCR against over current ?

   (c) Justify that input power factor of a semi-converter is better than that of full converter.

   (d) Find the average output voltage of a single phase full converter feeding a resistive load of R = 10 Ω and for a firing angle of 30°. The supply voltage is single phase 200V,50 Hz.

   (e) What is the advantage of PWM rectifier over phase control rectifier ?

   (f) How is the reactive power of a 1-Ph fully controlled rectifier affected by the firing angle ?

   (g) Draw the output voltage and current wave forms for a CLASS A Chopper feeding R-L-E load and operating in the discontinuous load current mode.

   (h) What is over modulation in SinPWM inverter operation ? Why is this mode of operation not used usually ?

   (i) What is the function of feed back diodes in Voltage Source Inverter ?

   (j) What are the disadvantages of Cuk converter over Buck-Boost converter ?

2. (a) Compare power MOSFET with power BJT. 5

   (b) Draw and explain the V-I characteristic of TRIAC. 5

P.T.O.

3. (a) Explain with circuit diagram and associated waveforms, the R-C triggering scheme for SCR. 5

(b) What is antisaturation control of BJTs ? Why it is necessary ? 5

4. A three phase, six pulse, fully controlled rectifier is connected to a three phase, 400 V, 50 Hz, Y-connected supply. The load resistance and inductance are 10Ω and 1 H respectively. For a firing angle $\alpha = 30°$, find the following : 10

(a) The average output voltage

(b) The average output current

(c) The rms output current

(d) The average output power

(e) The average thyristor current.

5. (a) With circuit diagram and waveforms explain the four quadrant operation of dc chopper. 5

(b) A buck regulator has an input voltage of 15V. The required average output voltage is 5V and the peak to peak output ripple voltage is 10 mV. The switching frequency is 20 kHz. The peak to peak current ripple of the inductor is limited to 0.5A.

Determine the filter inductance and filter capacitance. 5

6. (a) Compare flyback converter with forward converter. 5

(b) With an appropriate power circuit diagram, discuss the working principle of a three phase bridge type voltage source inverter. Draw phase and line voltage wave forms on the assumption that each controlled switch conducts for 180° and three phase resistive load is star connected. 5

7. (a) With neat circuit diagram and relevant waveforms explain the operation of zero voltage switching resonant inverter. 5

(b) With circuit diagram explain the operational principle of charging a 12 V battery. How is boost charging controlled ? 5

8. Write short nots on any **two** of the following : 5×2

(a) IGBT gate drive

(b) Push pull converter

(c) Space vector modulation

(d) Electronic ballast.