

Registration no:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

**B.TECH**  
**PCEL4301**

**5<sup>th</sup> Semester Regular / Back Examination 2015-16**  
**POWER ELECTRONICS**  
**BRANCH(S):EEE,ELECTRICAL**  
**Time: 3 Hours**  
**Max marks: 70**  
**Q.CODE: T255**

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

- Q1 Answer the following questions: (2 x 10)
- a) Differentiate between GTO & SCR.
  - b) What are the advantages of IGBT over BJT?
  - c) What is line commutated inverter?
  - d) What are the advantages of UJT triggering scheme over RC triggering scheme?
  - e) What is uncontrolled operation of a 1-Ø ac voltage controller?
  - f) What are the advantages of freewheeling diode in rectifier circuit?
  - g) Differentiate between soft switching and hard switching.
  - h) Derive the expression of average output voltage in a 3-Ø Semiconverter.
  - i) Enumerate the difference between forward converter and buck converter.
  - j) Explain the working of a Third & Fourth Quadrant Converter.
- Q2 a) Explain the switching operation of SCR with relevant waveforms and describe the times associated with it. (5)
- b) A thyristor is fed from a constant DC voltage source of 240V and connected to a resistive load of  $R_L=50\Omega$ . The specified limits for  $\frac{di}{dt} = 60A/\mu sec$  and  $\frac{dv}{dt} = 300V/\mu sec$ . Determine the value of di/dt inductance and snubber circuit parameters. Assume damping ratio  $\xi=0.5$ . (5)

- Q3 A single phase semi converter is operated from 230V, 50 Hz ac supply. The load current is continuous and ripple free with an average value of 10A. For firing angle of  $\alpha = \pi/3$ , determine. (10)
- (1) Form Factor
  - (2) THD of input current
  - (3) Input Power Factor
  - (4) Rectification Efficiency
  - (5) TUF
- Q4 a) Explain the operation of a three-phase fully controlled rectifier with R load. For a firing angle of  $90^\circ$  sketch the waveforms of (a) Output Voltage (b) Load current (c) A phase supply current (d) Voltage across one Thyristor. (7)
- b) For a 3- $\phi$  supply of 415V, 50 Hz determine the average output voltage for the above problem. (3)
- Q5 a) Explain the working principle of single phase bridge type Cycloconverter with R load for a firing angle of  $30^\circ$  to obtain output frequency ( $f_0$ ) = supply frequency ( $f_s$ )/4 with suitable waveforms. (5)
- b) A single phase full wave ac voltage controller has a resistive load of  $R=10\Omega$  and the input voltage is  $V_s=120V(\text{rms})$ , 60 Hz. For a delay angle of  $\pi/2$  determine (a) the rms output voltage  $V_0$  (b) the average thyristor current. (5)
- Q6 a) Explain the operation of Buck-Boost Regulator with suitable waveforms and derive the expression of average output voltage. (5)
- b) The Buck-Boost Regulator has an input voltage of  $V_s=12V$ . The duty cycle  $k=0.25$  and the switching frequency is 25 KHz. The inductance  $L=150 \mu\text{H}$  and filter capacitance  $C=220 \mu\text{F}$ . The average load current  $I_a=1.25\text{A}$  Determine (a) Average output voltage  $V_a$  (b) Output voltage ripple  $\Delta V_0$  (c) inductor ripple current  $\Delta I$ . (5)
- Q7 a) Explain the  $180^\circ$  conduction mode operation of a 3- $\phi$  VSI. Draw the waveforms of (a) gate pulses (b) phase voltages (c) line voltages. (5)
- b) Describe the different modes of operation of a ZVS Resonant converter with proper circuit diagram and associated waveforms. (5)
- Q8 Write short notes on any two: (5 x 2)
- a) Sinusoidal PWM
  - b) Uninterruptible Power Supply
  - c) Push-Pull converter
  - d) Static VAR Compensator