B.Tech. ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

June, 2013

BIEEE-018 : ADVANCED POWER ELECTRONICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **seven** questions out of **eight** questions. Each question carries **equal** marks.*

1. (a) Describe the switching characteristics of power MOSFETs and compare power MOSFETs with BJTs. 6

(b) A bipolar transistor having β in range 8 to 40. The load resistance $R_C = 11\Omega$, dc supply voltage $V_{CC} = 200V$, $V_B = 10$ V. If V_{CE} (sat) $= 1.0V$ and $V_{BE}(sat) = 1.5V$. Find : 4

(i) the value of R_B that results in saturation with an overdrive factor 5

(ii) Forced β_f

(iii) Power loss P_T

2. Explain the working of 3 ϕ full converter with the help of waveforms. Consider the load is resistive. Also derive an expression for average value of o/p voltage. 10

3. (a) Draw the circuit diagram of 3 ϕ square wave inverter and explain its working with the help of waveforms. 6

(b) What is the effect of blanking time on voltage in PWM inverters ? 4

4. (a) Compare VSI and CSI. What are applications of CSI ? Explain the operation of 1 ϕ capacitor commutated CSI with R load. 7

(b) Calculate the output frequency of a series inverter with following parameters L = 6 mH, C = 1.2μF, load resistance R = 100 Ω T_{off} = 0.2 ms. If load resistance is varied from 40 to 140 ohms, find out the range of o/p frequency. 3

5. (a) Explain the three phase 180 mode of conduction in bridge inverter. Draw the waveforms also. 6

(b) A three phase bridge inverter is fed from a dc source of 200 V. If the load is star connected of 10 Ω/ phase pure resistance, determine the r.m.s load current, the required r.m.s current rating of thyristor and load power for : 4

(i) 120° firing

(ii) 180° firing

6. Explain the operation of STATCOM and compare it with static var compensator. 10

7. Derive a general expression for the fundamental and harmonic content of a quasi square wave o/p inverter. Plot curves showing harmonic variation against width variation of the wave on period. 10

8. Write short notes on : 10
   (a) GTO
   (b) IGBT
   (c) Active power filter
   (d) Harmonic elimination method