B

B.Tech. Degree IV Semester Examination April 2014

EE 1406 INDUSTRIAL AND POWER ELECTRONICS
(2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

PART A
(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Explain the V-I characteristics of a SCR.
    (b) Explain the switching characteristics of MOSFET, with neat diagram.
    (c) Explain the working of a fully controlled rectifier with RL load.
    (d) Briefly explain the speed control of permanent magnet motors.
    (e) What is modulation index? Briefly explain sine PWM inverter.
    (f) Briefly explain the working of Jones chopper.
    (g) Explain $\dfrac{dv}{dt}$ protection of switches.
    (h) What is induction heating? Give it's applications.

PART B

(4 x 15 = 60)

II. (a) Explain the two transistor analogy of SCR.   (10)
     (b) Explain series operation of SCR.   (5)

OR

III. (a) Explain the operating principle of power MOSFET.   (5)
      (b) Draw the TRIAC characteristics and explain its modes of operation.   (10)

IV. Explain four quadrant operation of DC motor   (15)

OR

V. With suitable waveform explain the working of a three phase full wave controlled   (15)
rectifier and obtain the expression for average output voltage.

VI. (a) Explain Class A and Class B commutation of SCR with suitable waveforms.   (11)
     (b) Compare between square wave and sine PWM inverter.   (4)

OR

VII. (a) Explain slip power recovery scheme of induction motors.   (10)
      (b) Briefly explain the working of a full bridge square wave inverter with suitable   (5)
waveforms. Compare the power output of full bridge and half bridge inverters.

VIII. Draw the circuit diagram of buck converter. Derive the expression for output voltage, (15)
inductor L and capacitor C with suitable waveforms.

OR

IX. (a) Explain the operation of online UPS.   (4)
     (b) Briefly explain solid state relays.   (3)
     (c) A buck boost converter has input voltage of V_s=15V turn off time T_{off} =0.028 ms   (8)
switching frequency is 25kHz. Inductance is L = 135 μH and filter capacitance is
C= 220 μF. The average load current I_a = 1.28A.
Determine:
         (i) Average output voltage.
         (ii) Peak-peak output voltage ripple.
         (iii) Peak-peak ripple current of the inductor.

***