***U.S.N*** | | | | | | | | | | |

# P.E.S. College of Engineering, Mandya - 571 401

***(An Autonomous Institution affiliated to VTU, Belgaum)***

**Fifth Semester, B.E. - Electrical and Electronics Engineering**

**Semester End Examination; Dec. - 2015**

**Power Electronics**

*Time: 3 hrs* *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*

**UNIT - I**

1 a. Define Power electronics. Explain the Power Electronic converter system with the help of block diagram. Explain the peripheral effects and their remedies. 10

b. Describe the construction and switching characteristics of a MOSFET. 10

2 a. Draw the circuit symbol, VI characteristics and one application of various types of semiconductor devices. 10

b. Explain the switching characteristics of a transistor. 6

c. Give the comparison between MOSFET and BTJ. 4

**UNIT - II**

3 a. Explain any two methods of base drive control with relevant circuit and expressions. 8

b. Discuss the methods of providing Isolation of drive circuits from power circuits. 4

c. Explain the two transistor model of a thyristor and comment on their switching characteristics. 8

4 a. Explain $\frac{di}{dt}$ and $\frac{dv}{dt}$ effects and their protection. Explain the operation of Snubber circuit. 10

b. What is the need of series and parallel operation of thyristors? With relevant circuit and VI characteristics explain series and parallel operation. 10

**UNIT - III**

5 a. Mention and explain the various types of communication circuits in brief. 10

b. What do you mean by AC voltage controller? Explain the principle of ON/OFF Control ACVC. Derive an expression for its rms O/P voltage. 10

6 a. Explain the working of a resonant pulse SCR communication circuit with necessary diagram and waveforms. 8

b. An impulse commutated thyristor circuit has $V_s$ = 200 V, R = 10 Ω, C = 5 μF. Determine the available turn OFF time of the circuit if capacitor is initially charged to $-V_0 = -V_s$. 4

c. Explain shy short duration pulses are not suitable for ACVC with inductive loads. 4

Contd…2

d. A full wave ACVC controller supplies to a resistive load of R = 10 Ω from an input voltage $V_s$ = 200 V, 60 Hz. The delay angles of the thyristors are equal $\alpha_1 = \alpha_2 = \pi/2$. Determine ; 4

i) RMS output voltage and ii) Input power factor.

**UNIT - IV**

7 a. Explain the principle of operation of step up chopper with the circuit and waveforms. 6

b. A step up chopper has an input voltage of 220 V and output voltage of 660 V. If the conducting time of the thyristor chopper is 100 μs, compute the pulse width of output voltage. 4

c. Give the comparison between half bridge and full bridge inverters. 6

d. A single phase full bridge inverter has R = 10 Ω and the DC input voltage is $V_S$ = 220 V. Calculate;

i) RMS output voltage 4

ii) Average and peak current of thyristor

iii) Output power.

8 a. Explain one, two and four quadrant choppers with relevant circuit and operating characteristics. 10

b. With necessary circuit and waveforms, explain 3 phase bridge inverter in 120º mode. 10

**UNIT - V**

9 a. Mention the applications of Converters? Explain the principle of operation of 1ϕ half wave converter with RL load. Derive an expression for its output voltage. 10

b. The 1ϕ full converter is operating from a 120 V, 50 Hz supply and provides an average load current of 5 A at a delay angle of α = 30º, if the ripple content of the load current is negligible. Calculate;

(i) DC load voltage 10

(ii) DC output power

(iii) The quantities mentioned above when freewheeling diode is connected to the same circuit.

10 a. With necessary circuit and waveforms, explain the operation of 1ϕ full bridge converter. 10

b. With necessary circuit and waveforms, explain the operation of 3ϕ half controlled converter. 10

* * * *