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

(An Autonomous Institution affiliated to VTU, Belgaum)

Fourth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; June/July - 2015

Industrial Electronics

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.

ii) Assume suitable missing data if any.

UNIT - I

1. a. Explain different types of power converters with suitable waveforms. Also list the applications of power electronics. 8
- b. Explain the peripheral effects of power converters. 6
- c. With the help of a neat waveforms. Explain the control characters of power BJT, MOSFET and IGBT. 6
2. a. With the help of a neat diagram explain the cross section and equivalent circuit for IGBTs. 8
- b. Explain dv/dt and di/dt . What are its limitations? 6
- c. Explain the need for Isolation of gate and base drives. 6

UNIT - II

3. a. Explain the operation of the thyristor with the help of two transistor analogy. 8
- b. Explain turn-on and turn off dynamic characteristics of the thyristor. 8
- c. Ten thyristors are used in a string to withstand a dc voltage of $V_s = 15$ kV. The maximum leakage current and Recovery charge differences of thyristors are 10 mA and 150 μ C respectively. Each thyristor has a voltage sharing resistance of $R = 56$ k Ω , $C_1 = 0.5$ μ F. Compute; 4
 - i) $V_{DS(max)}$ ii) Derating factor (DRF)
 - iii) Transient voltage derating factor iv) Maximum transient voltage sharing $V_{DT(max)}$
4. a. Explain the different ways of turning on the thyristors. 4
- b. Explain dv/dt and di/dt protection in thyristors. 8
- c. With the help of neat waveforms and circuit diagram, explain UJT firing circuit. 8

UNIT - III

5. a. With the help of neat diagram and waveforms explain the principle of ON-OFF AC Voltage controllers. 8
- b. Explain the working of single phase-Bidirectional controllers with Inductive load. 10

- c. List the applications of AC voltage controllers. 2
6. a. Explain the principle of operation of single phase semi converter. 8
- b. The single phase dual converter is operated from 120, 60 Hz supply and the load resistance $R = 10 \Omega$. The circulatory inductance $L_C = 40 \text{ mH}$ delay angles α_1 and α_2 are 60° and 120° . Calculate peak circulatory current and peak current of converter I. 4
- c. Explain the working of single phase dual converter. What are the advantages of circulating current in dual converters? 8

UNIT - IV

7. a. With the help of a neat diagram explain the principle of step-down operation in choppers. 6
- b. Explain the operation of step down chopper for inductive loads with the help of wave forms. 8
- c. Explain two quadrant and four quadrant choppers. 6
8. a. Explain the principle of operation of step-up chopper. 8
- b. Explain the performance parameters of choppers. 4
- c. A choppers is feeding an R_L load with $V_S = 220 \text{ V}$, $R = 5\Omega$, $L = 7.5 \text{ mH}$, $f = 1 \text{ kHz}$, $K = 0.5$, and $E = 0 \text{ V}$. Calculate;
- i) Minimum instantaneous load current I_1 8
- (ii) Peak Instantaneous load current I_2
- (iii) Maximum peak to peak Ripple current
- (iv) The average value of load current I_a .

UNIT - V

9. a. Explain the principle of operation of single phase half-bridge inverter. 8
- b. Explain the following parameters :
- (i) Harmonic factor of nth harmonic 6
- (ii) Total Harmonic Distortion
- (iii) Distortion factor DF
- c. Write a note on current source Inverter. 6
- 10 a. List the specifications of standard power supplies used in Industries. 4
- b. Explain the four common configurations of switch mode power supplies. 16

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