GANPAT UNIVERSITY

B.TECH SEM. V ELECTRONICS & COMMUNICATION ENGINEERING

REGULAR EXAMINATION, NOV/DEC-2015

2EC 503 Power Electronics & Applications

TIME: 3 Hrs.]   [TOTAL MARKS: 70

Instructions:

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

SECTION-I

1 (A) Explain reverse recovery characteristics of power diode and relate I_{RM} with Q_R.   6
  (B) Explain two transistor model of thyristor and derive equation of gate current.   6

OR

1 (A) Draw and explain SCR V-I characteristics in detail.   6
  (B) Explain working of TRIAC in all four modes with neat sketches.   6

2 (A) Explain the working of a single phase full wave controlled rectifier using a center tapped transformer with inductive load.   6
  (B) Draw and explain class B and class C chopper.   5

OR

2 (A) Explain difference between symmetric IGBT and Non symmetric IGBT with necessary figures.   5
  (B) What is freewheeling diode? Discuss its application in single phase half wave controlled rectifier.   3
  (C) Explain closed loop control of DC drives.   3

3 (A) If a half wave controlled rectifier has purely resistive load of R and delay angle $\alpha = 60°$, determine 1. η 2. FF 3. RF 4. TUF   5

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  (B) Draw two transistor equivalent model of GTO and relate I_{GN} with turn off gain.   5
  (C) Why inductance value (L) is kept high for any controlled rectifier?   2

SECTION-II

4 (A) Draw and explain single phase fully controlled bridge converter operating in both modes. **6**

(B) Explain why power devices are connected in parallel? Explain the necessary circuits you will use to ensure proper paralleling of SCRs **6**

OR

4 (A) What is the importance of snubber circuit? Find design parameters (R and L) for the snubber network for d.c. circuit. **6**

(B) Explain principle of dual converter. **3**

(C) Thyristor string VI ratings are 6kV and 4kA respectively. Thyristor have VI ratings of 1.2kV and 1kA respectively. For 90% string efficiency, calculate no. of SCRs to be connected in series and parallel. Assume max blocking current of 15mA and ΔQ_{max} is $25\mu C$ and calculate values of R and C of equalizing network. **3**

5 (A) Define/Explain in brief: 1. ODF 2. Intrinsic Standoff Ratio 3. UJT Snowballing effect 4. Softness factor 5. Holding Current 6. Importance of drift region in power device **6**

(B) Draw all possible configurations of single phase full wave AC voltage controller and explain any one with related waveforms. **5**

OR

5 (A) Explain principle of operation of inverters. Classify inverters according to various parameters. **6**

(B) Explain principle of induction heating and dielectric heating with advantages of each. **5**

6 (A) Draw two transistor equivalent model of GTO and relate I_{GN} with turn off gain.

(B) Write a short note on SIT.

(C) Define UPS and draw block diagrams of online and offline UPS.

END OF PAPER