

GANPAT UNIVERSITY
B.TECH SEM. V (EC) ELECTRONICS & COMMUNICATION ENGINEERING
CBCS REGULAR EXAMINATION, NOV/DEC-2014
(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

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|-----------|-----|---|---|
| 1 | (A) | Draw the structure of SCR and two transistor equivalent of SCR. Explain operation of SCR with two transistor analogy. | 6 |
| | (B) | For a particular circuit total voltage and current ratings are 7.5 KV and 1000 Amp. SCRs with a rating of 500V and 75 Amp are available. Assume derating factor of 14%. Calculate the number of SCRs connected in series and in parallel required to handle the given source voltage and current. | 4 |
| | (C) | Define : Pulse transformer, Delay angle | 2 |
| OR | | | |
| 1 | (A) | Draw and explain the necessity of static and dynamic equalizing circuits for series connected SCRs? Derive relations used for determining the values of shunt resistor R and capacitor C in this circuit. | 8 |
| | (B) | What is significance of di/dt rating of an SCR? How SCR can be protected against high di/dt? Explain. | 4 |
| 2 | (A) | State different turn on methods. State the merits of gate turn on. | 4 |
| | (B) | Explain the terms: (i) Voltage commutation and (ii) current commutation as applied to forced commutation of thyristor. Describe Class – C type of commutation used for thyristors with appropriate current and voltage waveforms. | 8 |
| OR | | | |
| 2 | (A) | Explain the half wave and full wave RC firing circuit. | 6 |
| | (B) | Explain the working of a single phase full bridge inverter with resistive load. | 6 |
| 3 | (A) | If a half wave controlled rectifier has purely resistive load of R and delay angle $\alpha = 90^\circ$, determine 1. η 2. FF 3. RF 4. TUF | 4 |
| | (B) | Explain dual mode dual converter with its block diagram. | 4 |
| | (C) | Draw and basic two configurations of UPS. | 3 |

SECTION-II

- 4 (A) Classify power electronic converter circuits with their principle of operation, design, components involved and applications. 6
(B) Explain reverse recovery characteristics of power diode and relate I_{RM} with Q_R . 6
OR
- 4 (A) What is a unijunction transistor? Explain its structure and characteristics. 6
(B) Explain power diode with its structure and I-V characteristics. Differentiate power diode types. 6
- 5 (A) Draw two transistor equivalent model of GTO and relate I_{GN} with turn off gain. 6
(B) Draw and explain class B and class C chopper. 6
OR
- 5 (A) Explain the working of a single phase full wave controlled rectifier using a center tapped transformer with purely resistive load. 4
(B) Explain closed loop control of DC drives. 4
(C) Draw and explain full wave A.C. Voltage Controller with resistive load including harmonics of output quantities. 4
- 6 (A) Write a short note on DC drives. 3
(B) Draw and explain IGBT's operating principle. 3
(C) List advantages of induction heating. 3
(D) Define chopping frequency and duty cycle. 2

END OF PAPER