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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 11241

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Elective

Power Electronics and Drives

PX 4006 – MODERN RECTIFIERS AND RESONANT CONVERTERS

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define RMS value of the AC waveform.
2. Justify the reason for selecting higher value of capacitor in rectifiers.
3. Outline the effect of capacitor in rectifiers.
4. Write the disadvantages of PWM rectifiers.
5. What are resonant converters?
6. What is the need for limiting the switching frequency in resonant converters?
7. Define linear system.
8. Draw the average converter model.
9. Mention the various control techniques of PWM rectifier.
10. Mention the functions of rectifier controller.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the construction and working of three phase rectifier with continuous and discontinuous conduction mode with neat diagram.

Or

(b) Explain the harmonics and their causes, effects and its minimization using suitable capacitor value.

12. (a) What are the properties of ideal rectifiers? Explain the single phase converter system incorporating ideal converters.

Or

(b) Discuss the working of Boost rectifier and also derive the expressions for duty cycle and DC load current.

13. (a) Analyze the steady state operation of resonant converters with the relevant waveforms.

Or

(b) Explain the zero current switching and zero voltage switching of Quasi resonant buck converter with the waveform.

14. (a) Explain the state space average model of Buck-Boost switching mode DC/DC converter with the circuit diagram.

Or

(b) Explain the dynamic analysis of switching mode DC/DC converter with the waveform.

15. (a) Explain in detail, the non linear carrier control of PWM rectifiers with suitable assumptions.

Or

(b) Explain the working of the variable structure control for source current shaping of PWM rectifier.

PART C — (1 × 15 = 15 marks)

16. (a) Analyze the application of PWM converters in renewable energy with suitable examples.

Or

(b) Design the Quasi square wave resonant converter which has the following required specifications:

$V_{out} = 25V$,
$P_{out} = 80W$,
$F_{sw,min} = 50kHz$,
$600V$ *MOSFET and* $V_{in} = 85 \sim 205V_{rms}$