Reg. No. :

Question Paper Code : 50487

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fifth Semester

Electrical and Electronics Engineering

EE6503 – POWER ELECTRONICS

(Common to : Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/Mechatronics Engineering)

(Regulations 2013)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions

PART – A   (10×2=20 Marks)

1. Why Triac is not popular as compared to SCR ? Justify.

2. What are the advantages of IGBTs ?

3. Distinguish between symmetric and asymmetric semiconductor configuration.

4. Define input power factor.

5. What is the effect of load inductance on the load current waveforms in the case of DC chopper ?

6. What is the disadvantage of frequency modulated chopper ?

7. State the necessity of return current diodes in inverter.

8. What is the function of feedback diodes in bridge inverter ?

9. Why is half wave AC voltage regulator not used ?

10. Explain the term sequence control of ac voltage regulators.

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PART – B   (5×13=65 Marks)

11. a) Explain the static and switching characteristics of IGBT and MOSFET.   (13)

(OR)

b) Explain why triac is rarely used in I quadrant with negative pulse and in III quadrant with positive pulse.   (13)

12. a) Explain the functional modes of dual converter with necessary diagrams.   (13)

(OR)

b) Explain the operation of 3 phase fully controlled bridge rectifier with necessary waveforms.   (13)

13. a) Explain the working of buck converter with neat waveform and also derive the expression of peak to peak voltage across the capacitor.   (13)

(OR)

b) Explain the steady state analysis of step down chopper.   (13)

14. a) Explain the operation of series resonant inverter.   (13)

(OR)

b) Discuss the operation of 180° conduction of three phase inverter.   (13)

15. a) Explain the operation of single phase to single phase cycloconverter.   (13)

(OR)

b) Explain the operation of matrix converter.   (13)

PART – C   (1×15=15 Marks)

16. a) A single-phase, half-wave rectifier with an AC voltage of 150 v has a pure resistive load of 9 Ω. The firing angle α of the thyristor is $\pi/2$. Determine the

    a) Rectification efficiency

    b) Form factor

    c) Transformer derating factor

    d) Peak inverse voltage of the SCR

    e) Ripple factor of the output voltage.

    Assume that the transformer ratio is 2 : 1.

(OR)

b) The series resonance turn-off circuit of Fig. 16 b has the following data :
   $E = 160\,v$, $L = 8\,MH$, resistance of inductor coil $r_L = 0.2\,\Omega$, $R_{ld} = 0.6\,\Omega$ and $C = 65\,\mu F$.

Determine :

   a) Derive an expression for the current i(t).

   b) The pulse width and

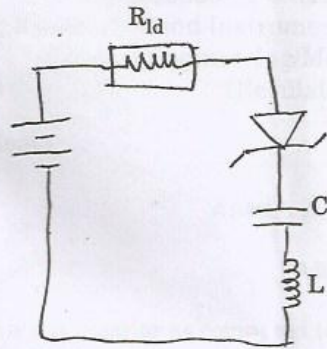   c) The time required for the capacitor voltage to attain a voltage equal to 1.7 E.

Fig. 16. b