Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 80500

B.E./B.Tech DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Electrical and Electronics Engineering

EE 2301/EE 51/10133 EE 504/10144 EE 504 – POWER ELECTRONICS

(Common to Instrumentation and Control Engineering)

(Regulations 2008/2010)

(Also common to PTEE 2301 for B.E. (Part-Time)EEE-Fourth Semester-Regulations 2009)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Why are IGBT becoming popular in their application to controlled converters?

2.   Define the term pinch off voltage of MOSFET

3.   What is meant by phase control?

4.   Why power factor of semi converter is better than full converter?

5.   Brief up the working of four quadrant DC chopper.

6.   What is constant frequency control of chopper?

7.   What is the advantage of 120° mode of inverter operation over 180° mode?

8.   List the various advantage of using PWM control to inverters?

9.   What are the types of ac voltage controllers?

10. What is matrix converter?

PART B — (5 × 16 = 80 marks)

11. (a) Describe about any one driver circuit and snubber circuit for MOSFET and IGBT. (16)

Or

(b) (i) Discuss the different modes of operation of thyristor with the help of its static V-I characteristics. (8)

(ii) Explain why triac is rarely operated in I quadrant with –Ve gate current and in III quadrant with +Ve gate current. (8)

12. (a) Explain the operation of single phase controlled rectifier which can be operated both in rectification and inversion made. (16)

Or

(b) A 3-phase 6 pulse full converted is connected resistive and inductive load of 10Ω and 1H respectively from 3-phase, 220 V, 50HZ, Y-connected supply. For firing angle is 30 degree, determine (16)

(i) Average output voltage

(ii) Average output current, and

(iii) rms output current.

13. (a) (i) A dc battery is charged from a constant dc source of 220 V, through a chopper. The dc battery is to be charged from its internal emf of 90 V to 122 V. The battery has internal resistance of 1Ω. For a constant charging current of 10A, compute the range of duty cycle. (8)

(ii) Explain with a neat circuit diagram one of the configurations of SMPS. (8)

Or

(b) (i) Explain the principle of working of a step up chopper with neat circuit diagram and necessary waveforms. Derive the expression for its average output voltage. (10)

(ii) Write short note on resonant switching. (6)

14. (a) Discuss in detail about the functioning of three phase voltage source inverter in 120° operation mode. (16)

Or

(b) Explain in detail, the various types of PMW methods employed in an inverter. (16)

15. (a) (i) Explain about multi-stage sequence control of voltage controllers. (8)

      (ii) Explain Multiple Pulse Width Modulation. (8)

Or

   (b) (i) Explain the principle of integral cycle control. (8)

      (ii) A single phase voltage controller has input voltage of 230V, 50Hz and a load of $R=15\Omega$. For 6 cycles ON and 4 cycles OFF, determine.

         (1) rms output voltage

         (2) input pf and

         (3) average and rms thyristor current. (8)

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