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Fourth Semester B.E. Degree Examination, June 2012

Power Electronics

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. With neat diagrams, explain the various types of power electronic circuits. (12 Marks)
- b. Explain the control characteristics of power electronic devices. (08 Marks)
- 2 a. Explain the different types of base drive control circuits for BJT. (11 Marks)
- b. In the bipolar transistor circuit shown in Fig.Q2(b) β varies between 5 and 50. The load resistance $R_C = 10 \Omega$, $V_{CC} = 180 \text{ V}$ and $V_{BB} = 10 \text{ V}$. If $V_{CE(sat)} = 1.0 \text{ V}$ and $V_{BE(sat)} = 1.4 \text{ V}$, find:
 - i) The value of R_B that results in saturation with an over drive factor of 6
 - ii) The forced β_f and
 - iii) The power loss P_T in the transistor.

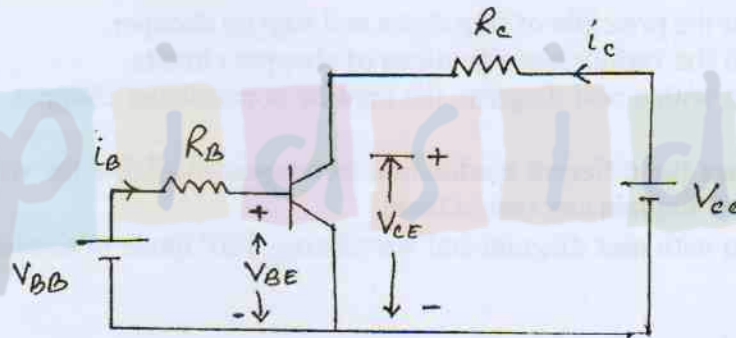
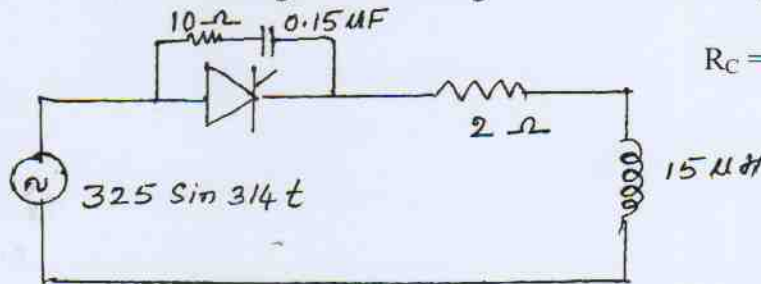


Fig.Q2(b)

(09 Marks)

- 3 a. Derive an expression for the anode current of thyristor with the help of two transistor analogy. (08 Marks)
- b. For the circuit shown in Fig.Q3(b) calculate:
 - i) The maximum values of $\frac{di}{dt}$ and $\frac{dv}{dt}$ ratings of SCR.
 - ii) Find the RMS and average current ratings of the SCR for firing angle of 90° .



$R_C = 10 \Omega$, $C = 0.15 \mu\text{F}$

Fig.Q3(b)

(12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 a. What do you mean by natural and forced commutation in thyristor circuits? Explain with waveforms and circuits any two types of forced commutation. (10 Marks)
- b. Explain the various types of firing circuits of a thyristor. (10 Marks)

PART - B

- 5 a. In a single phase half wave controlled circuit shown in Fig.Q5(a) with pure resistive load $\alpha = \frac{\pi}{3}$. Determine:
- i) Rectification efficiency ii) Form factor iii) Ripple factor
- iv) Transformer utilization factor v) Peak inverse voltage

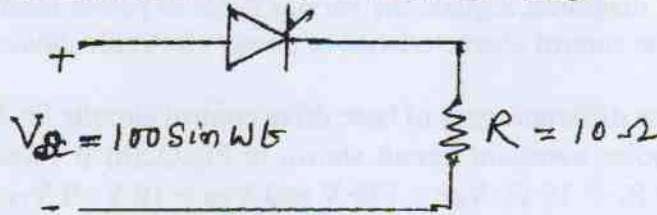


Fig.Q5(a)

- (10 Marks)
- b. Explain with a neat diagram and waveforms the operation of a 3 ϕ fullwave converter with R load. (10 Marks)
- 6 a. Explain the principle of step down and step up chopper. (04 Marks)
- b. Explain the various classifications of chopper circuits. (10 Marks)
- c. Explain with a neat diagram, the impulse commutated chopper. (06 Marks)
- 7 a. What are the different modulation techniques available for voltage control of single phase inverter? Explain any two of them. (10 Marks)
- b. Explain with neat diagram and waveforms, 120 $^\circ$ mode of conduction of a 3 ϕ inverter. (10 Marks)
- 8 Write short notes on:
- a. Principle of ON-OFF control
- b. Principle of phase control
- c. Effect of power electronic converters
- d. Current source inverter. (20 Marks)
