CBCS SCHEME

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18EE53



# Fifth Semester B.E. Degree Examination, June/ July 2025
## Power Electronics

Time: 3 hrs. Max. Marks: 100

***Note: Answer any FIVE full questions, choosing ONE full question from each module.***



### Module-1

1 a. Explain different types of power electronics converter systems with neat diagram and wave forms. **(10 Marks)**

b. Explain with structure and switching characteristics of power diode. **(10 Marks)**

**OR**

2 a. Draw & explain with expression the working of 1 ϕ full wave bridge diode rectifier with RL loud. **(10 Marks)**

b. A 1 ϕ full wave diode bridge rectified in supplied with 230 V 1ϕ AC supply resistive load 60Ω is connected across output of rectifier. Calculate DC and RMS power consumed by load. Calculate peak current flowing through diodes. **(10 Marks)**

### Module-2

3 a. What is necessity of base drive control? Explain various methods of base drive control of BJT. **(12 Marks)**

b. What is a MOSFET? Draw, explain static and switching characteristics of a MOSFET. **(08 Marks)**

**OR**

4 a. Explain the structure of IGBT and switching characteristics of IGBT. **(12 Marks)**

b. A power BJT showing Fig. 4(b). Calculate $R_B$ that will result in saturation with ODF of 20, Forced β and power loss in transistor.

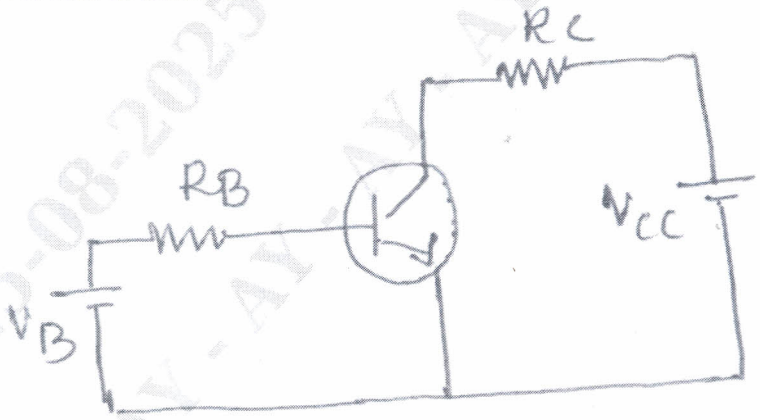


Fig. Q. 4 (b)

$V_{cc}$ = 100 V, $V_B$ = 8 V, $V_{CE(SAT)}$ = 2.5 V, $V_{BE(Sat)}$ = 1.75 V
β of the transistor is varied from 10 to 60 $R_c$ = 10 Ω **(08 Marks)**

## Module-3

5 a. With the help of two transistor model, derive an expression for anode current of a thyristor and explain why gate lost its control over the device once SCR is turned on. **(12 Marks)**

b. A 3 $\phi$ converter is used for HVDC transmission system and is operated for 3 $\phi$ 25 KV. Supply, thyristor each of 1600 V/16 A are available. The forwarded leakage current difference of the device is 35 MA. The string efficiency can be assumed to be 85% and $\Delta Q_{max}$= 25 $\mu$c.

i) Determine the number of devices to be connected in series.

ii) Equalizing components. **(08 Marks)**

**OR**

6 a. With the neat diagram and waveform explain the working of UJT triggering technique with expression. **(12 Marks)**

b. Discuss the need of production against $\frac{di}{dt}$ and $\frac{dv}{dt}$. Explain how it is achived with suitable diagrams. **(08 Marks)**

## Module-4

7 a. With neat circuit diagram explain single phase dual converter. **(12 Marks)**

b. A single phasefully controlled bridge rectifier in fed from 230 V, 50 Hz supply. The load is highly inductive. Find the average load voltage and current if the R = 10 $\Omega$ and $\alpha$ = 45°. Draw supply of current waveform. **(08 Marks)**

**OR**

8 a. With neat diagram explain single phase bidirectional controller with RL load. Derive for $V_o$(rms). **(12 Marks)**

b. For the ACVC shown in Fig. the delay angles of thyristors $T_1$ and $T_2$ are equal.

$\alpha_1 = \alpha_2 = \frac{2\pi}{3}$, determine i) $V_o$ (rms) ii) Input Power Factor

iii) RMS current of thyristor.

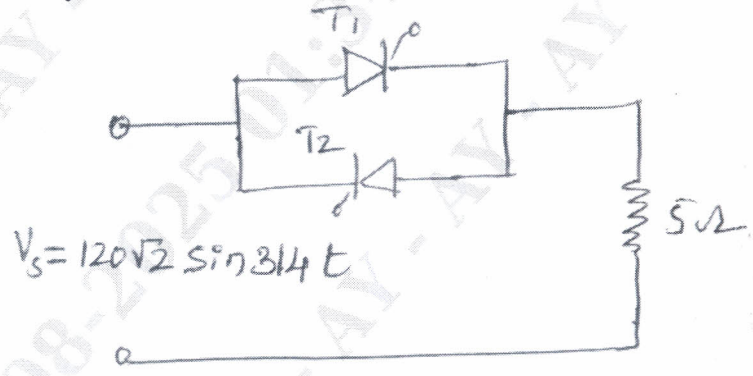


Fig. Q. 8 (b) **(08 Marks)**

## Module-5

9 a. How chopper are classified? Give quadrants of operation and one application of each. **(10 Marks)**

b. With neat circuit diagram explain the operation of step – up chopper. **(10 Marks)**

**OR**

10 a. Explain :

i) Sinusoidal pulse width modulation

ii) Phase displacement techniques **(10 Marks)**

b. Explain with neat circuit diagram and wave form of single phase Bridge Inverter with RL Load. **(10 Marks)**