

**TEMPLECITY INSTITUTE OF TECHNOLOGY & ENGG.  
(DIPLOMA)**

**Internal Assessment Test-W-2021**

**Sub: - PE&PLC**

**FM – 20**

**Branch: - EE / ECE**

**5<sup>th</sup> Sem**

**Time: - 1 Hour**

(Figures in the right-hand margin indicate marks)

**1. Answer All the Question.**

**(3 x 2 marks)**

- (a) What is the definition of Power electronics?
- (b) What are the family members of Thyristors?
- (c) What is the Construction of SCR?
- (d) Why SCR is universally called as Thyristor?

**2. Answer Any Two.**

**(2 x 3.5 marks)**

- (a) What is the average value of half wave control Rectifier with R-Load?
- (b) What is the RMS value of half wave control Rectifier with R-Load?
- (c) What is the average value of full wave control Rectifier with R-Load?

**3. Answer any One.**

**(1 x 07 marks)**

- (a) Derive Step down Chopper.
- (b) Derive Full wave AC voltage controller.
- (c) Derive half wave control Rectifier with R-L Load.

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Writing Space

P.E & PLC

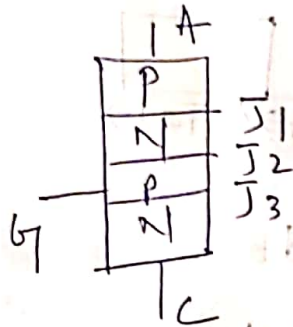
5th sem

EE / ECE

(1) a) It may be defined as the application of electronic principles for the control and conversion of electrical power in high power level rather than low power levels.

- b)
- SCR
  - DIAC
  - TRIAC
  - GTO
  - RCT
  - MCT

c)



It is a 4 layer 3 junction and 3 terminal device.

d) The SCR is most widely used (almost 99% in the power electronics industry), so the SCR is almost universally called as thyristor.

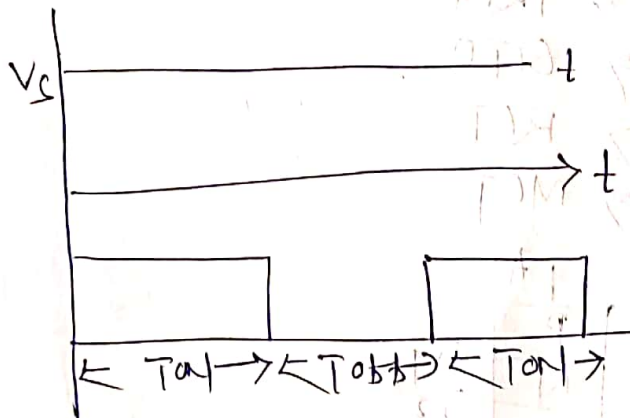
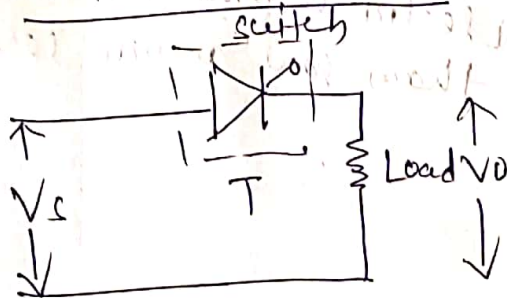
(2) a)  $V_{dc} = \frac{V_m}{2\pi} (\text{Heard})$

b)  $V_{rms} = V_m \left[ \frac{1-\alpha}{4\pi} + \frac{\sin 2\alpha}{8\pi} \right]^{\frac{1}{2}}$

c)  $V_{dc} = \frac{V_m}{\pi} (\text{Heard})$

3)

a) step down chopper

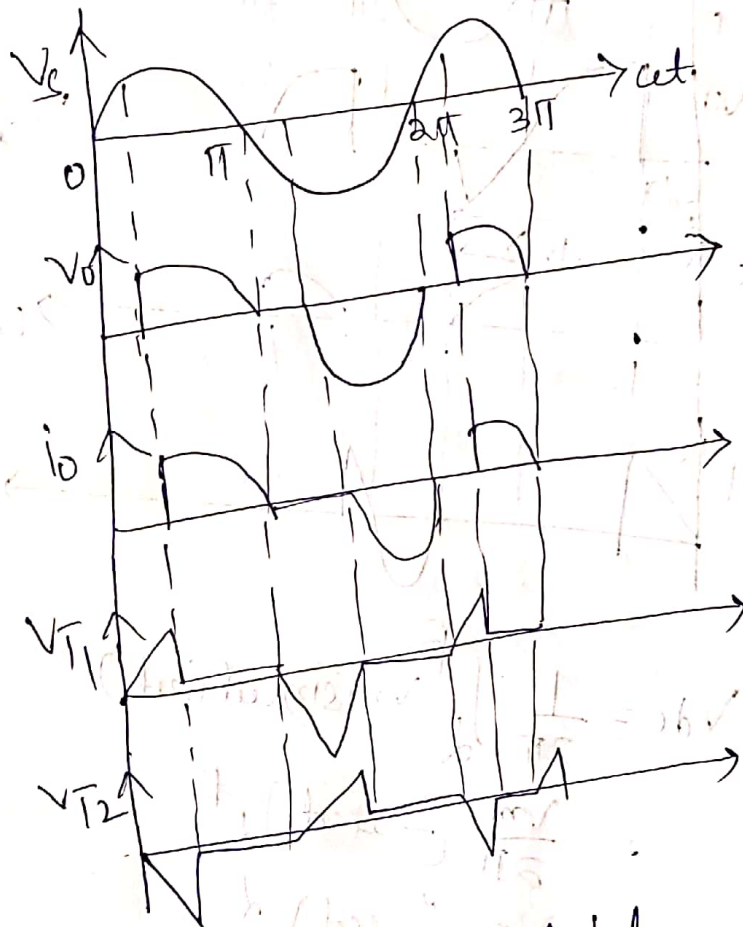
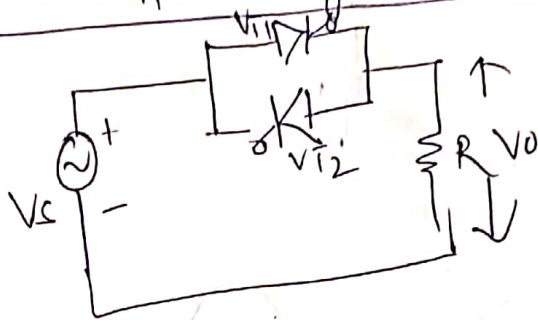


$$\begin{aligned}
 V_{avg} &= \frac{1}{T} \int_0^{T_{ON}} V_s dt \\
 &= \frac{V_s}{T} (t) \Big|_0^{T_{ON}} \\
 &= \frac{V_s}{T} T_{ON} \\
 &= \frac{T_{ON}}{T} V_s = \alpha V_s
 \end{aligned}$$

$$\boxed{V_{avg} = \alpha V_s}$$

(2)  
b)

### Full wave AC voltage controller

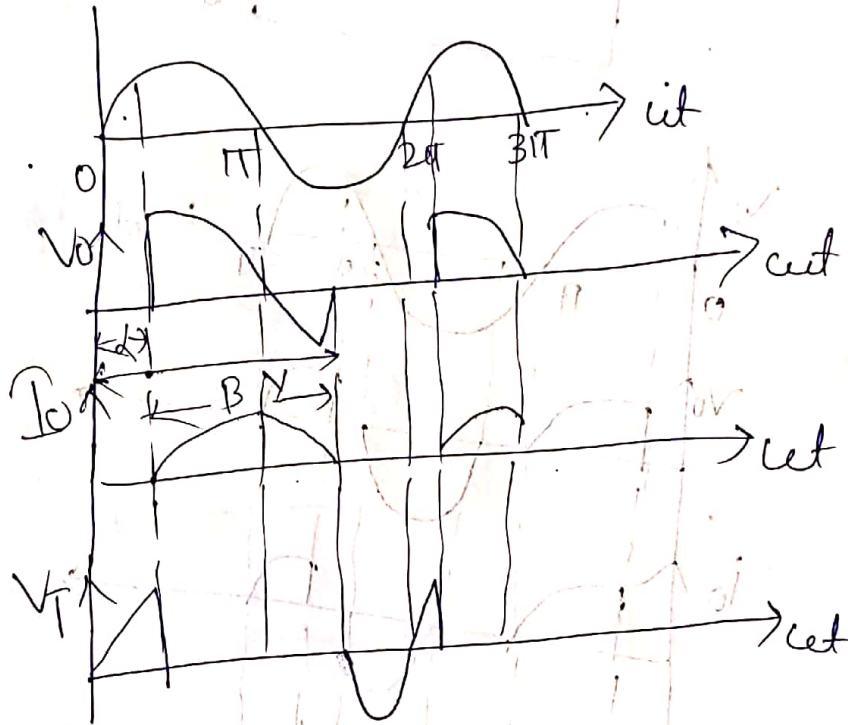
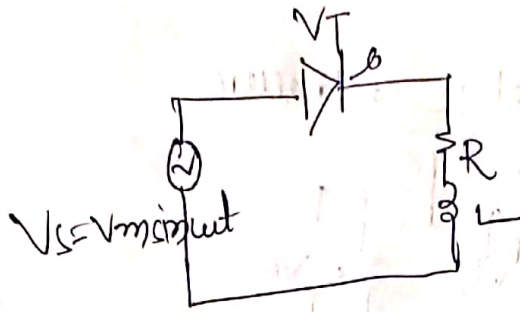


$$V_{avg} = \frac{1}{\pi} \int_0^{\pi} V_m \sin \omega t \, d\omega t$$

$$= \frac{V_m}{\pi} (1 + \cos \omega t)$$

$$V_{avg} = \frac{V_m}{\pi} (1 + \cos \omega t)$$

(3)  
9



$$V_{dc} = \frac{1}{2\pi} \int_{\alpha}^{\beta} V_m \sin \omega t \, d(\omega t)$$

$$= \frac{V_m}{2\pi} [-\cos \omega t]_{\alpha}^{\beta}$$

$$= \frac{V_m}{2\pi} (\cos \alpha - \cos \beta)$$

$$V_{dc} = \frac{V_m}{2\pi} (\cos \alpha - \cos \beta)$$