

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2019
B. Tech. in Electrical Engineering, Semester VI

Roll No.....

EE603: INDUSTRIAL ELECTRONICS

Time: 3 hours

Max. Marks: 100

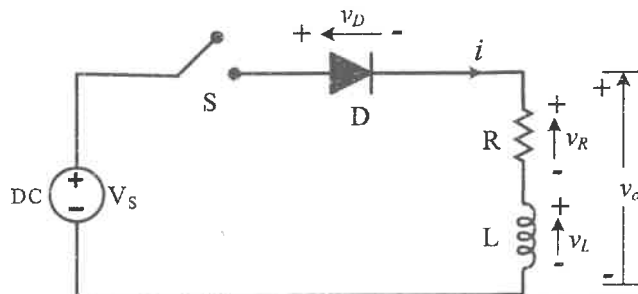
Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1 Give the reasons leading to widespread use of power electronic converters. Also provide the block diagram of power electronic system. 7+3
LO1

Q.2 How is the magnitude of breakdown voltage effected if a junction has highly doped
(i) layers on its both sides and
(ii) layer on its one side only? 5+5
LO1

Q.3 10
LO2

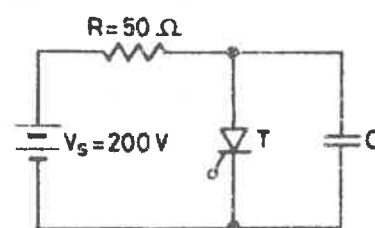


In the circuit shown in figure, if V_s is x volts, then what will be the value of v_o . Is v_o depend upon L or C? Justify your answer with suitable derivations.

OR

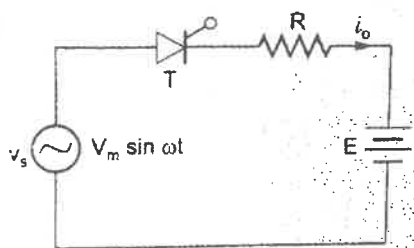
Find the time required to deliver a charge of 200 Ah through a single-phase half-wave diode rectifier with an output current of 100 A rms and with sinusoidal input voltage. Assume diode conduction over a half-cycle. LO2

Q.4 In the circuit shown in figure, SCR is forced commutated. Compute the minimum value of C so that SCR does not turned on due to re-applied dv/dt . The SCR has minimum charging current of 5 mA to turn it on and its junction capacitance is 25 pF.



10
LO4

Q.5



$$E = 150 \text{ V.}$$

- Find the power supply to battery and dissipated in the resistor.
- Calculate the supply pf.

A dc battery is charged through a resistor R as shown in figure. Derive an expression for the average value of charging current in terms of V_m , E , R etc. on the assumption that SCR is fired continuously.

- For an ac source voltage of 230 V , 50 Hz , find the value of average charging current for $R = 8 \Omega$ and

15
LO2

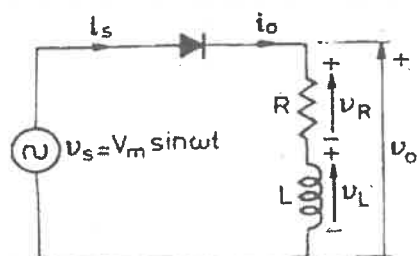
OR

A welding set requires a single-phase ac supply passes through a single-phase transformer and then through a half-wave controlled rectifier. Consider supply is 230 V , 50 Hz and delivers power to a load $R = 10 \Omega$. For a firing-angle delay of 60° , determine

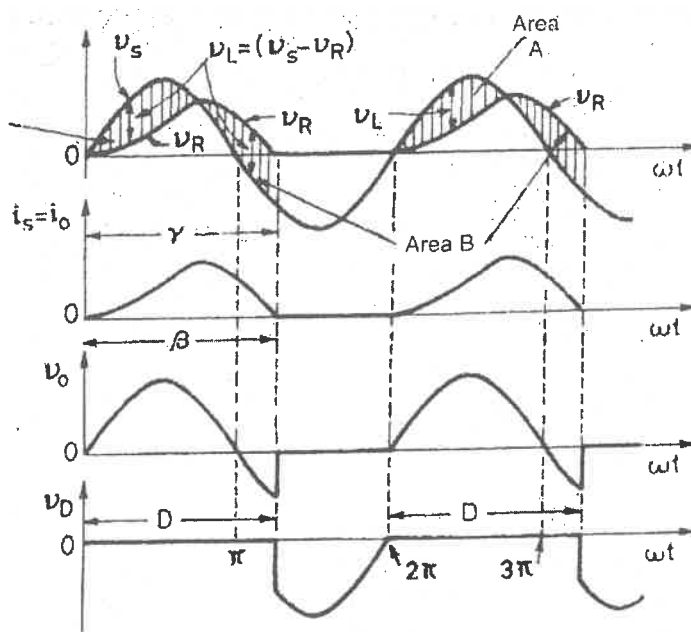
LO4

- the rectification efficiency,
- form factor,
- voltage ripple factor,
- transformer utilisation factor,
- PIV of thyristor.

Q.6



For the given RL series circuit with ac load, corresponding waveforms are also shown. How the waveforms will change if an extra diode will be added with anode of diode connected to negative side of L and cathode is connected to positive side of R .

10
LO8

- A solar panel is charging a battery energy storage system. Solar panel is generating 48 V while battery needs 36 V for charging. What technique should be used between solar panel and battery for charging and why? Provide suitable mathematical support for your answer.

10
LO3

- A single-phase bridge inverter delivers power to a series connected RLC load with 2Ω and $\omega L = 10 \Omega$. The periodic time $T = 0.1 \text{ msec}$. What value of C should the load have in order to obtain load commutation for the SCRs? The thyristors turn-

10
LO6

off time is $10\mu\text{sec}$. Take circuit off time as $1.5 t_q$. Assume that load current contains only fundamental component.

- Q.9 Out of two control strategies of AC voltage regulators namely phase control and integral cycle control, which one is better and why? Support your answer suitable analysis and waveforms. 10 LO5
- Q.10 A 3-phase to 1-phase cycloconverter employs a 3-pulse positive and negative group converters. Each converter is supplied from delta/star transformer with per phase turns ratio of 2:1. The supply voltage is 400 V, 50 Hz. The RL load has $R = 2\ \Omega$ and at low output frequency, $\omega_0 L = 1.5\ \Omega$. In order to account for commutation overlap and thyristors turn-off time, the firing angle in the inversion mode should not exceed 160° . Compute: 05 LO6
- a) the value of fundamental output voltage
 - b) rms output current and
 - c) output power.

