

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), November 2018

B. Tech. in Electrical Engineering, Semester VI

Roll No.....

EE603: Industrial Electronics

Time: 3 hours

Max. Marks: 100

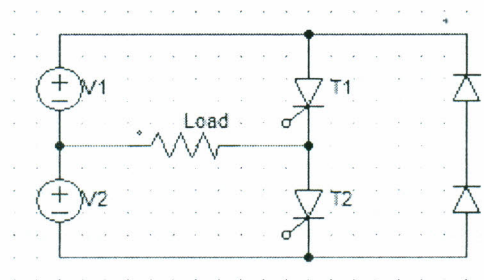
Instructions to students:

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.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

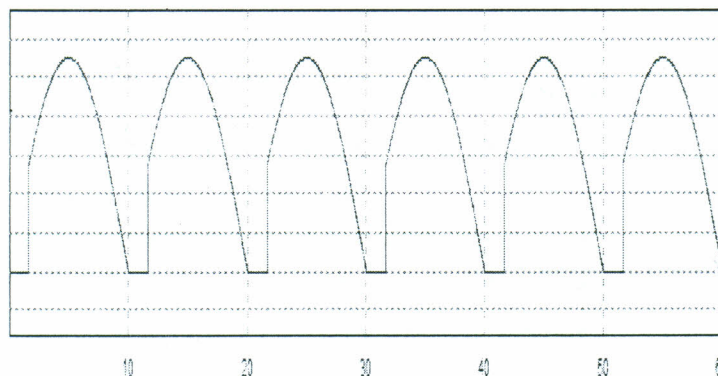
i. Identify the circuit given below.



- (a) Half wave series inverter
(c) Half wave bridge inverter

- (b) Full wave series inverter
(d) Half wave parallel inverter

ii. A semi-converter circuit gives the following voltage waveform. Find the expression for the average output voltage with $V_s = V_m \sin \omega t$ and firing angle α



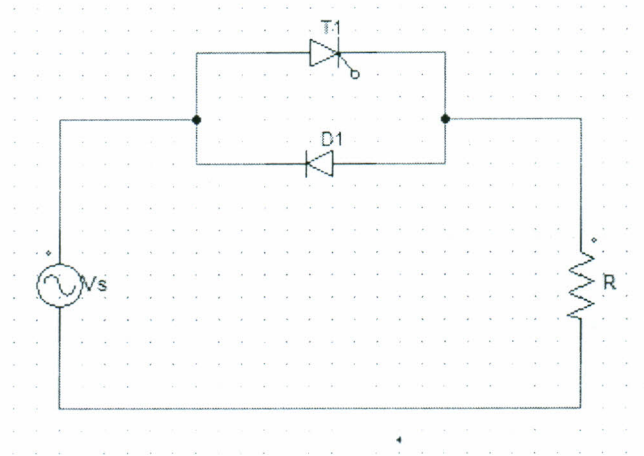
- (a) $(V_m/\pi) \cos \alpha$
(c) $(2V_m/\pi) \cos \alpha$

- (b) $(V_m/\pi) (1 + \cos \alpha)$
(d) $(2V_m/\pi) (1 + \cos \alpha)$

iii. A cycloconverter is a

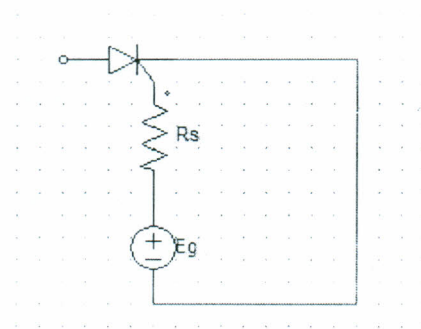
- (a) one stage power converter (b) one stage voltage converter
(c) one stage frequency converter (d) none of the mentioned

iv. The below shown controller circuit is a



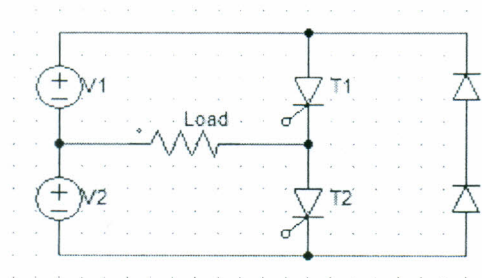
- (a) will depend upon the firing angle (b) full wave controller
(c) none of the mentioned (d) half wave controller

v. The gate-source voltage is $E_s = 16$ V and the load line has a slope of 128 V/A. Calculate the gate current for an average gate power dissipation of 0.5 W.



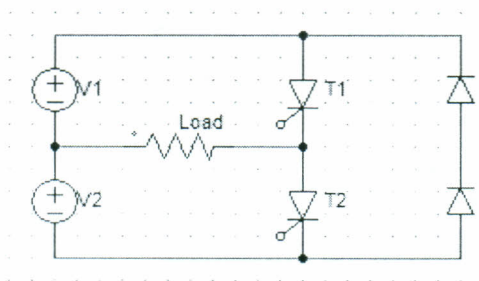
- (a) 56.4 mA (b) 100.25 mA (c) 62.5 mA (d) 80.65 mA

vi. What is the voltage across the R load when only T1 is conducting?



- (a) V_s (b) $V_s/2$ (c) $2V_s$ (d) zero

vii. Identify the circuit given below.



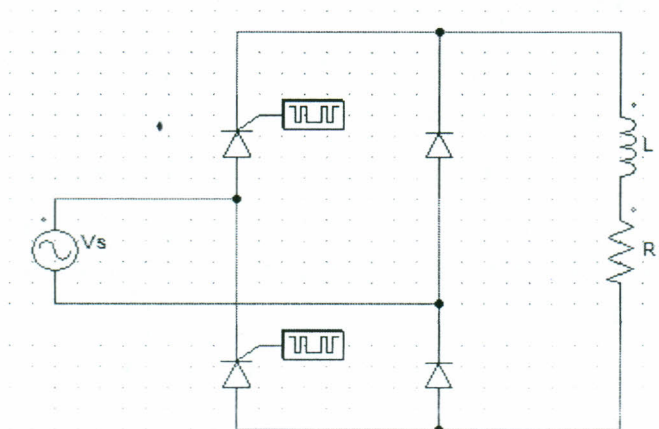
(a) Half wave series inverter

(b) Full wave series inverter

(c) Half wave bridge inverter

(d) Half wave parallel inverter

viii. For the circuit shown below, T1 and T2 (from top T1 and T2) are both fired at an angle α . Then from $\omega t = \pi$ to $\omega t = \pi + \alpha$



(a) None of the devices conduct

(b) T1 and one diode will conduct

(c) T2 and one diode will conduct

(d) Both the diodes will conduct

ix. For an SCR the total turn-on time consists of

i) Delay time

ii) Rise time and

iii) Spread time

During the delay time the

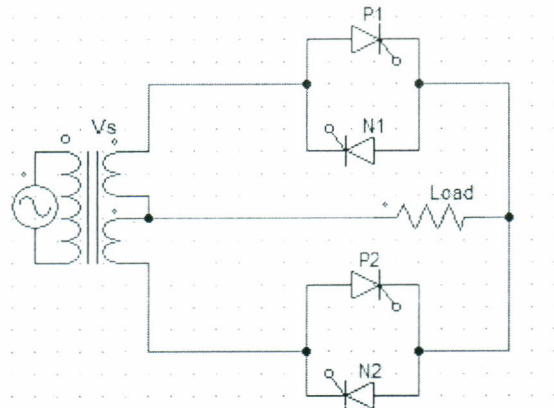
(a) anode current flows only near the gate

(b) anode current rises from zero to very high value

(c) losses are maximum

(d) anode to cathode voltage is zero

x. In the below given cycloconverter circuit, _____ and _____ conduct in one cycle together.



(a) P1, P2 and N1, N2 (b) P1, N2 and N1, P2 (c) N1, P1 and N1, P2 (d) None

- Q.2** Short answer type questions (4 questions @ 2.5 marks) 10
- Differentiate between step up & step down chopper.
 - Explain the constructional and operational difference between MOSFET & IGBT.
 - List out any two advantages of dc chopper over controlled rectifiers.
 - List out any two advantages of freewheeling diode in controlled rectifier?
- Q.3A** Explain the effect of increasing the magnitude of the gate current and junction temperature on (i) forward and reverse break down voltages, (ii) forward and reverse leakage currents 05
- Q.3B** Explain the working of single phase half wave circuit with RL load and freewheeling diode. 05
- Q.4A** Explain with neat circuit & waveform the inversion operation of 1 phase fully controlled bridge rectifier. 05
- Q.4B** Explain the basic operating principle of class B chopper with circuit diagram. 05
- Q.5A** Explain the operation of three-phase semi converter for continuous modes of operation. Assume Resistive Inductive load for continuous modes of operation. 05
- Q.5B** Write the advantages of PWM and also explain single pulse width modulation techniques. 05
- Q.6A** Describe the reverse recovery characteristics expression of reverse recovery time. 05
- Q.6B** With neat circuit diagram explain the working principle of single phase semi converter draw its waveforms. 05

OR

- Q.6B** In the single phase full converter has a RL load having $L = 6.5 \text{ mH}$. the input voltage is $V_s = 120 \text{ V (rms)}$ at 60 Hz . Determine 05
- a) The load current I_{L0} at $\alpha = 60^\circ$

- b) The average thyristor current I_A
- c) The rms thyristor current I_R
- d) The rms output current I_{rms}
- e) The average output current I_{av}
- Q.7A A step down chopper supplied from dc source of 200V. The load parameter are $R=6\Omega$, $L=10mH$ & $E=60V$. The chopper is operating with chopping frequency of 1200Hz & duty cycle of 0.6. Assuming continuous conduction. Determine. 05
- (i) average load current (ii) current ripple
- Q.7B A 3-phase half-wave controlled converter is fed from 3 phase, 400v 50Hz source & is connected to load taking a constant current of 36A. Thyristors have a constant drop of 1.4v. 05
- a) Calculate average value of load voltage for a firing angle of 30° & 60°
- c) Find the average power dissipated in each thyristors
- OR
- Q.7B Explain the basic operating principle of class C chopper with circuit diagram. 05
- Q.8 Describe the basic principle of working of single phase to single phase step down cyclo converter for both continuous and discontinuous conduction for a bridge type cyclo converter with circuit and waveforms. Mark the conduction of various thyristors also. 10
- Q.9A A single phase bridge converter is connected to RLE Load. Current For continuous load draw the source voltage, output voltage, and load current, as a function of time. 10
- Q.9B Explain the three phase thyristorised bridge inverter with star connected resistance load, assuming 120° mode of operation. Draw the corresponding output phase and line voltage of inverter 10
- OR
- Q.9B Explain the three phase thyristorised bridge inverter with star connected resistance load, assuming 180° mode of operation. Draw the corresponding output phase and line voltage of inverter 10