



SE-6825

**B. E. III (Sem. V) (Instrumentation & Control)
Examination
April / May – 2011
Power Electronics**

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दृष्टावेव निशानीवाणी विगतो उत्तरवही पर अवश्य लभवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="checkbox"/> B. E. 3 (Sem. 5) Instrumentation & Control	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="checkbox"/> Power Electronics	<input type="text"/>
Subject Code No. : <input type="text"/> 6 <input type="text"/> 8 <input type="text"/> 2 <input type="text"/> 5	<input type="text"/>
Section No. (1, 2,.....) : <input type="text"/> 1&2	
	Student's Signature

- (2) Attempt all questions.
(3) Figures to right indicate full marks.
(4) Answer of two sections must be written in separate answer books.

SECTION - I

- 1 (a) Give the answers in brief : 10
(1) Draw the constructional diagram of GTO.
(2) What is PUT ?
(3) Draw V-I triac characteristics.
(4) Define intrinsic strand off ratio with respect to UJT.
(5) Why SCRs need to be connected series ?
(b) Explain the design aspects of snubber circuit. 8
- 2 (a) With the help of ckt diagram and associated waveforms, explain resonant commutation. 8
(b) Derive the equation for static equalizing network for series connected SCRs. Explain the term 'String frequency'. 8

OR

- 2 (a) With the help of ckt diagram and associated waveforms, explain class D commutation. 8
- (b) Explain the switching characteristics of SCR during turn on and turn off process with neat sketch. 8
- 3 Give answers of any two : 16
- (1) A thyristor string is formed by the series and parallel connection of thyristors. The voltage and current ratings of the string are 6 kV and 4 kA respectively. Available thyristors have the voltage and current rating of 1.2 kV and 1 kA respectively. The string efficiency is 90% for both series and parallel connections. Calculate the number of thyristors to be connected in series and parallel.
- If the maximum blocking current is 15mA and $\Delta Q_{\max} = 25\mu C$, calculate the values of R and C for series equalizing ckt.
- (2) Draw and explain the working of UJT relaxation oscillator. Discuss how the amplitude of output voltage pulse can be estimated.
- (3) (i) How are magnitudes of gate voltage and gate current influenced by temperature rise in a thyristor ?
- (ii) Define any four anode voltage rating of SCR.

SECTION - II

- 4 (a) Give the answers in brief : 10
- (1) In a 1 phase full converter, the number of SCRs conducting during overlap is ____.
- (A) 1 (B) 2
- (C) 3 (D) 4

- (2) A 1 phase half wave ckt is one which produces _____ number of pulses of load current during one cycle of source voltage.
- (A) two (B) three
(C) six (D) only one
- (3) For discontinuous load current and extinction angle $\beta > \pi$ in a 1 phase full converter each SCR conducts for
- (A) α (B) $\beta - \alpha$
(C) β (D) $\beta + \alpha$
- (4) In a dual converter, converter 1 and 2 works as
- (A) 1 as rectifier, 2 as inverter
(B) Both as rectifier
(C) Both as inverter
(D) None.
- (5) 1 each diode of three phase half wave diode rectifier conduct for
- (A) 60° (B) 120°
(C) 180° (D) 90°
- (6) A four Quadrant operation requires
- (A) Two full converter in series
(B) Two full converter connected in back to back
(C) Two full converter connected in parallel
(D) Two semi converter connected in back to back
- (7) Draw the diagram of DC Jones Chopper. 2
- (8) Classify the converters. 2
- (b) Draw the diagram of DC Jones Chopper with suitable waveforms. 8
- 5 (a) Explain 3 phase half controlled converter with R load with suitable waveforms. 8
- (b) Explain the effect of freewheeling diode in 1 phase full wave converter with associated waveforms. 8

OR

- 5 (a) Explain the principle of operation for an ideal dual converter. 8
- (b) Obtain the expression for average output voltage, output current, RMS voltage, RMS current, power delivered to resistive load, input voltage amperes for single phase full wave rectifier with R-L load. 8
- 6 Answer any two questions : 16
- (a) A fully controlled bridge rectifier supplies R load. By assuming the constant output current is it I_o find the following performance factor if the supply voltage is 230V and if the firing angle is $\pi/2$ and $R=15$ ohms.
- (a) Average output voltage (E_{dc}).
- (b) Average output current (I_{dc}).
- (c) Supply rms current (I_{rms}).
- (d) the rectification efficiency.
- (e) form factor.
- (f) Voltage ripple factor.
- (b) A 3 phase fully controlled bridge rectifier is supplied at 230V/phase and at a frequency of 50 Hz. The source inductance $L_s=5$ mH and the load current on the DC side is constant at 12 mA. If the load consists of a DC source voltage of 230 V having an internal resistance of 0.9 ohm, find,
- (i) Firing angle.
- (ii) Overlap angle.
- (c) A 3-phase half wave controlled rectifier is supplied at 230v/ph, 50Hz, the source inductance and resistance b being 1.8mH and 0.05Ω respectively. By assuming thyristor voltage drop = 1.8v and continuous load current of 30A.
- Find,
- (1) Average output voltage (E_o) at 0° , 45° , 60° .