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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(EIE) (2011 & Onwards) (Sem.-5)

INDUSTRIAL ELECTRONICS

Subject Code : EI-309

M.Code : 58025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**1. Answer briefly :**

- a) Differentiate between turn-On time and turn-Off time of SCR.
- b) What do you mean by PWM control strategy in chopper?
- c) Draw the two-transistor model of SCR.
- d) Describe integral cycle control in brief.
- e) What do you mean by gate triggering and why it is preferred over other methods?
- f) Draw the circuit of single-phase parallel inverter and write down relation between output voltage and capacitor voltage.
- g) Draw and explain the V-I characteristics of SCR with proper labelling.
- h) A step-up chopper has input voltage of 220 V and output voltage of 660 V. If T_{ON} time is 100 μ s, Find out the pulse width of output voltage.
- i) Which pulse rectifier has lowest value of ripple factor and why?
- j) Write down the basic performance equation for a separately excited dc motor.

SECTION-B

2. Draw the output voltage and current waveform for single phase symmetrical semiconverter with proper conduction status of thyristors and diodes for resistive load of $R = 10\Omega$ and input power supply of 230V. Also calculate the circuit turn off time of each components and average output current.

3. A unijunction transistor, used in relaxation oscillator, has the following data :

$$\eta = 0.67, I_v = 10 \text{ mA}, V_v = 2.5 \text{ V}, I_p = 15 \text{ }\mu\text{A}$$

An oscillator with output frequency of 1 kHz is to be designed by using this UJT. Compute the value of charging resistor and external resistor needed in the base circuits. Take $C = 0.4 \text{ }\mu\text{F}$ and forward voltage drop of E-B₁ junction as **0.5V**. Source voltage is **24V** and triggering pulse width is **50 μs** .

4. A single-phase unidirectional voltage controller is connected to a load $R = 20\Omega$, input voltage is **230V, 50Hz**. Firing angle delay is 60° . Determine
- rms and average output voltage
 - input power factor
 - average diode current
 - average thyristor current.
5. Explain with the help of circuit diagram and necessary timing waveforms, the working principle of a single-phase half bridge modified-series inverter.
6. A dc chopper is used to control the speed of a separately excited dc motor. The dc supply voltage is **220 V**, armature resistance $r_a = 0.2$ and motor constant $K_a \Phi = 0.08\text{V/rpm}$. This motor derives a constant torque load requiring an average armature current **25A**. Determine
- the range of speed control
 - the range of duty cycle α . Assumed the motor current to be continuous.

SECTION-C

7. Describe in detail the operation of voltage commuted chopper with its relevant current and voltage waveforms as a function of time. The chopper operation may be divided into certain well defined modes. Enumerate the various simplifying assumptions made. Also find out the minimum permissible on-period in term of commutating parameters.
8. Describe in detail the operation of 3 phase full converter thyristor bridge with inductive load with relevant current and voltage waveforms for a firing angle of 30° . Also derive the expression of average output voltage.
9. Write short notes on following :
- Cycloconverter.
 - Pulse width modulation inverters.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.