

D : PH (April Exam) 203

Con. 8344-13.

GS-5410

(3 Hours)

[Total Marks : 100

N.B. (1) Question No. 1 is compulsory.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) **Figures** to the **right** indicate **full** marks.

(4) Assume suitable data, if **any**.

1. (a) Explain constant torque and constant power drive methods with relevant diagram and waveforms. 5
- (b) A single phase full converter is made to deliver a constant load current. For zero degree firing angle the overlap angle is 15° . Calculate the overlap angle when firing angle is 45° . 5
- (c) Induction motor speed control with constant supply voltage and reduced supply frequency is rarely used in practice. Justify the statement. 5
- (d) List the merits and demerits of online UPS and offline UPS. 5
2. (a) With neat circuit diagram explain the working of a load commutated chopper with relevant voltage and current waveforms. Show voltage variation across each pair of SCR's as a function of time. 10
- (b) Describe modified Mc-Murray Bedford half bridge inverter circuit with related voltage and current waveforms. 10
3. (a) Explain with neat diagram the working of parallel inverter employing feedback diodes. Draw the voltage and current waveforms. What care should be taken to avoid commutations failure? 10
- (b) A 220 V, 1000 rpm, 60A separately excited D.C. motor has an armature resistance of 0.1Ω . It is fed from a single phase full converter with an a.c. source voltage of 230V, 50Hz. Assuming continuous conduction, compute. 10
 - (i) firing angle for rated motor torque at 600 rpm.
 - (ii) firing angle for rated motor torque at (-500) rpm.
 - (iii) motor speed for $\alpha = 150^\circ$ and half rated torque.
4. (a) Draw and explain the power circuit of semiconverter feeding a separately excited D. C. motor. Explain with typical voltage and current waveforms the operation in both continuous and discontinuous armature current modes. 10
- (b) Draw the circuit diagram and explain the rotor resistance control method using chopper for the speed control of 3 phase induction motor. 10

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5. (a) Explain with relevant circuit diagrams the static scherbius drives for obtaining speeds below as well as above synchronous speeds. 10
- (b) State the need for reduction of harmonics in inverters. Outline the various methods for reduction of harmonics. Explain how harmonic reduction using stepped wave inverters is done. 10
6. (a) With the help of circuit diagram and waveforms, explain the operation of isolated flyback converter in discontinues mode. Also state the advantages and disadvantages. 10
- (b) A current commutated chopper is fed from a d.c. source of 230 V. Its commutating components are $L = 20 \mu\text{H}$ and $C = 50 \mu\text{F}$. If load current of 200 A is assumed constant during the commutation process then compute. 10
- (i) Turn off time of main thyristor
- (ii) total commutation interval
- (iii) Turn off time of auxiliary thyristor.
7. Write short notes on :-
- (a) Dual converter 7
- (b) PWM inverter 7
- (c) Step up chopper 7
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